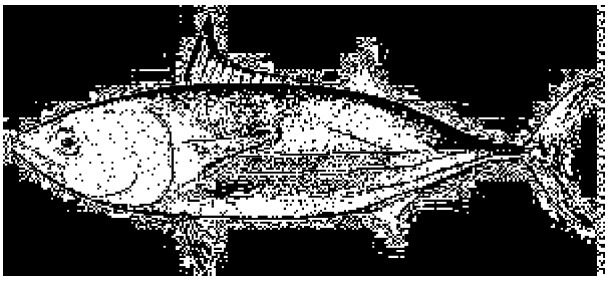
Economic Assessment of the Domestic Fisheries Development Potential of the Commonwealth of the Northern Mariana Islands



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ABSTRACT

Locally based pelagic fisheries in the Commonwealth of the Northern Mariana Islands have not developed to fully utilize the 200-mile EEZ, nor have they achieved harvest levels of formerly operating foreign fleets. This assessment provides the results of economic research focused on determining why domestic pelagic fisheries have not developed. The study utilizes an intercept interview methodology to obtain input from fishermen and assess profitability of the existing fishery. Investigative research is used to assess whether labor conditions, markets, infrastructure, regulations and the availability of finance are constraining development. Conclusions are made on the potential for expansion within the existing fishery as well as on the potential for development of larger-scale pelagic fisheries.

EXECUTIVE SUMMARY

This report documents the findings of research into the potential for development of domestic pelagic fisheries in the Commonwealth of the Northern Mariana Islands (CNMI). The research has relied on the analysis of data from intercept interviews of fishermen currently operating in the pelagic fishery of the CNMI. That data has been analyzed to show that the current pelagic fishery is a daily small boat surface trolling fishery that delivers a fresh product to market. The existing vessels are trailered sportfishing style vessels from 14 to 23 feet in length and are powered by gasoline engines ranging from 10 to 230 horsepower. Vessel operators reported taking trips as far as 50 miles offshore, however the average trip is less than twenty miles offshore. These vessels have very limited amenities, no refrigeration, and limited electronics. Most of these vessels are not capable of being safely outfitted with gear other than rod and reel gear and are not capable of extended trips. Thus, the most likely possibility for expansion in the existing fishery is via increased participation not changes in gear type or fishing methods.

The analysis has found that the existing pelagic fishery is generally profitable for a large majority of participants. Further, even if ex-vessel prices were to decline most participants still make a profit. However, it has also been found that profitability is highly dependent on the cost of fuel. Fuel was found to be the largest component of per trip variable costs and the locally high price of gasoline is effectively eating into fishing profits. The existing fishery was not found to suffer significantly from labor, infrastructure, finance, or regulatory constraints.

Development of larger-scale domestic pelagic fisheries in the CNMI does not appear to be likely at this time. The primary constraints on such development are that the available infrastructure is not oriented toward commercial fishing and it is not cost competitive with the Port of Guam. Further, locally based pelagic vessels must compete with imported fish landed in large volumes in Guam. Any locally based transshipment operations would also have to be competitive with Guam operations. Large-scale fish processing development is not seen as a potential for development due to potential conflicts with the tourism sector, environmental concerns, and the fact that such operations are currently struggling in the region.

In light of the limited potential for development of larger-scale pelagic fisheries, it seems prudent that the CNMI government should focus its efforts on promoting the existing small boat pelagic fleet. Vessels operating in the existing pelagic fleet are generally profitable at this time. Increased activity, participation, and harvests in that fishery do not appear to be constrained by regulations, finance, infrastructure, or labor. The primary constraint on the local small boat pelagic fishery is its limited local market, which may have been negatively affected by a decline in the local economy. Significant import competition also limits that market and will likely continue to do so. The existing fishery could also be negatively affected if foreign fishing were allowed in the EEZ adjacent to the CNMI. However, the potential for development of foreign fishing is limited and the potential revenues that might be earned from foreign fishing do not warrant risking the viability of the existing small boat pelagic fishery. Thus, efforts to develop the pelagic fisheries of the CNMI should focus on improvements in the existing small boat pelagic fishery.

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1.0 BACKGROUND AND PURPOSE

It is expected that many readers may not be familiar with the unique geography, history, and economy of the Commonwealth of the Northern Mariana Islands. Specific information on the fishing history and fish stock conditions may not be widely known. This section provides contextual background information on these topics and defines the purpose for the study.

1.1. GEOGRAPHY OF THE STUDY AREA

The Northern Mariana Islands extend over 250 miles from Rota in the south to Farallon De Pajaros in the north. The island chain is located in the tropical Western Pacific Ocean north of the island of Guam and extends from 14° to 21° north latitude and 145° to 146° east longitude. The total land area of the islands, including the uninhabited northern islands is approximately 184.5 square miles (Farrell, 1991). The highest elevation in the CNMI is 1,554 foot Mt. Tapotchao on Saipan (Farrell, 1991). In contrast to the small land area of the islands, the Exclusive Economic Zone surrounding the CNMI is approximately 291,800 square miles (SPC, 1999). The study area consists of the islands of Saipan, Tinian, and Rota. Saipan is the largest of the three islands with a total land area of 47 square miles. Tinian is approximate 39 square miles, and Rota is approximate 33 square miles (Farrell, 1991).

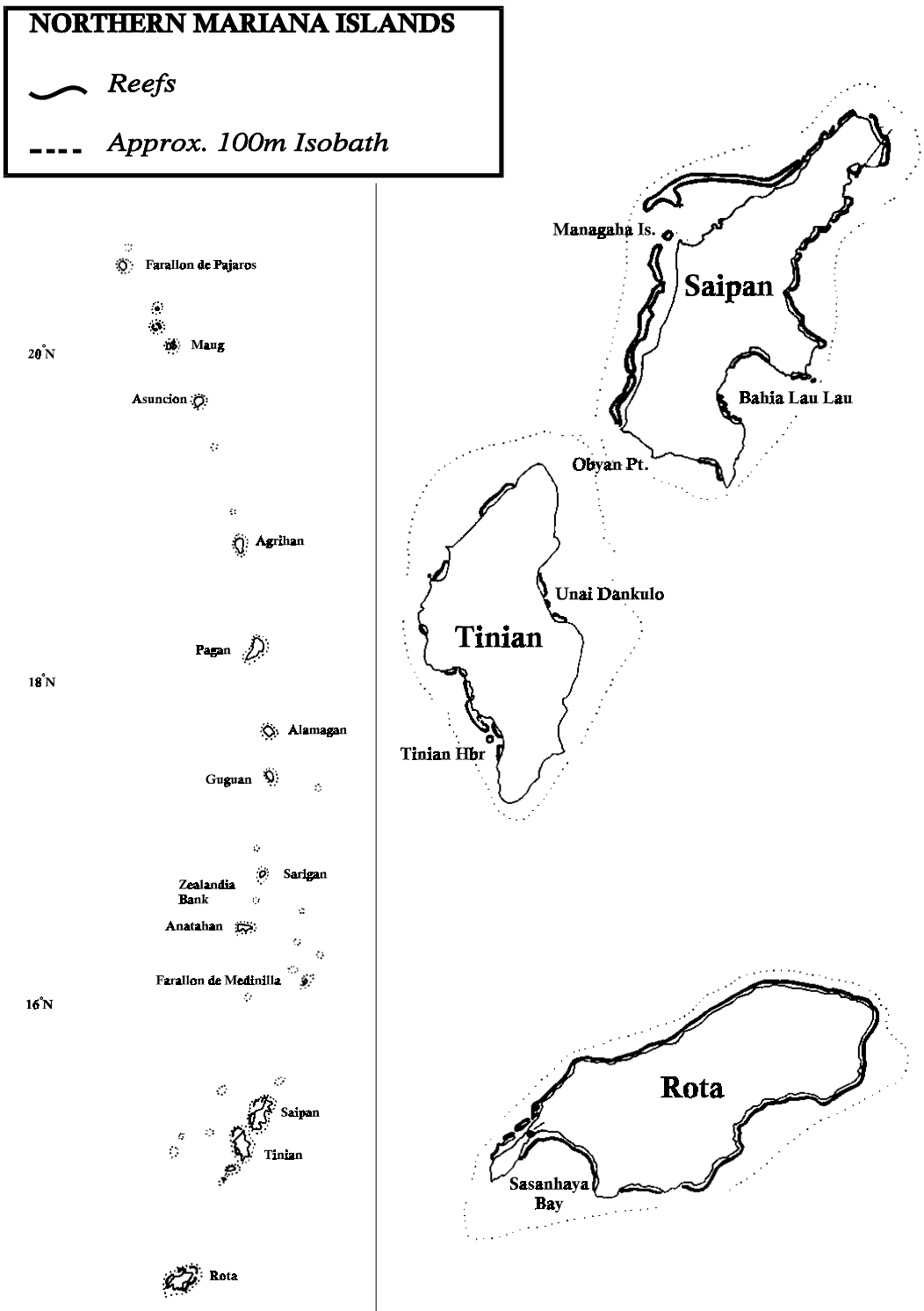
1.2. HISTORICAL BACKGROUND

Archaeological evidence based on carbon dating suggests that people first inhabited the Mariana Islands about 3,500 years ago. These ancient people are the ancestors of the present day Chamorro inhabitants of the Northern Marianas. The ancient Chamorro culture came into contact with western explorers in 1521 when Ferdinand Magellan landed in the Mariana Islands. Miguel Lopez de Legazpi claimed the islands for the king of Spain in 1565. During the period of Spanish rule Carolinian people were allowed to resettle in the Northern Marianas after a typhoon devastated several islands in the Caroline chain to the South of Guam. These Carolinian settlers were the ancestors of the present day Carolinian inhabitants of the Northern Marianas.

The Spanish continued to rule the Northern Marianas until they sold the Islands to Germany in 1899. The German administration of the Northern Mariana Islands lasted only about fifteen years and was brought to an abrupt halt at the start of the First World War. Great Britain declared war on Germany on August 4, 1914. Japan had entered into a secret alliance with Great Britain and sent a naval squadron to Micronesia. Japanese seized Saipan on November 2, 1914.

Following the First World War the Japanese administered the Northern Marianas and developed large-scale sugar cane farms on Saipan and Tinian. A large-scale phosphate factory was established on Rota. The Japanese government supported these developments and provided assistance to them by improving port facilities. Other businesses were established to support these enterprises and prospered until the beginning of World War II in 1941.

U.S. Marines landed on Saipan on June 15 and were followed by U.S. Army units. Following the taking of Saipan and Tinian, the U.S. military quickly developed extensive military infrastructure and continued to fight the war in the Pacific from bases in the Marianas. On April 2, 1947 the United Nations Security Council created the United Nations strategic Trust Territory of the Pacific Islands and placed it under U.S. authority.


NORTHERN MARIANA ISLANDS
Reefs
Approx. 100m Isobath
Farallon de Pajaros
Maug
20°N
Asuncion
Agrihan
Pagan
18°N
Alamagan
Guguan
Sarigan
Zealandia Bank
Anatahan
Farallon de Medinilla
16°N
Saipan
Tinian
Rota
Managaha Is.
Saipan
Bahia Lau Lau
Obyan Pt.
Unai Dankulo
Tinian
Tinian Hbr
Rota
Sasanhaya Bay

During the 1950's, municipal and district legislative governments were established in the Northern Mariana Islands. Many of the local residents wanted to create a permanent affiliation with the United States and to become U.S. citizens. However, it was not until 1970 and only after extensive negotiations that the United States proposed Commonwealth status for the Northern Marianas.

The Marianas Islands District Legislature approved the Commonwealth Covenant in February of 1975 and it was overwhelmingly approved in a local plebiscite. The U.S. Senate approved the agreement on February 24, 1976 although there was some opposition. President Ford approved the commonwealth covenant agreement by signing Public Law 94-241: 90 stat. 263 on March 24, 1976. The Commonwealth Constitution was signed on December 4, 1976 and was approved by ninety-four percent of the voters participating in a plebiscite on March 6th, 1977. President Carter approved the constitution establishing the Commonwealth of the Northern Mariana Islands (CNMI) on October 22, 1977.

1.3. POPULATION AND ECONOMY

The population of the Northern Marianas grew relatively slowly from 1950 to 1980. This was a period when the Northern Marianas were under the U.S. Trust Territory governance and foreign investment and economic development were rather restricted. In 1980, shortly after the Commonwealth was formed, the local population was only 16,780. The Commonwealth Covenant agreement granted local control of immigration, wage, and customs to the CNMI government. The local government liberalized foreign investment, established a low minimum wage and allowed businesses to utilize foreign "guest workers" to supplant locally available labor. There began an era of rapid expansion in the CNMI population as the economy grew.

Table 1.1: Northern Marianas Resident and Non-Resident Worker Population (Daily Visitor Population excluded)

Year	Population
1950	6,286
1955	7,710
1960	9,134
1965	9,982
1970	10,830
1975	12,894
1980	16,780
1985	30,062
1990	43,345
1995	58,846
2001 (projected)	89,400

Source: Stewart, William H., 1997.

From 1985 to 1990 the population grew by nearly forty-five percent. The rate of increase between 1990 and 1995 reduced to just over thirty-five percent. The projection for the year 2001 shown in table 1.1 represents a growth rate of nearly fifty-two percent. However, that projection was made in 1997 prior to the decline in Asian and local economies and may be inflated.

The population of the CNMI is mostly concentrated on the Island of Saipan. In 1995, the population of Saipan was 52,698 people, or nearly ninety percent of the total for the CNMI. Rota

was home to 3,508 people or about six percent of the CNMI total. Tinian was home to 2,631 people or about five percent of the total and the remainder lives in the remote northern islands.

Table 1.2: 1995 Population by Island

Island	Population
Saipan	52,698
Rota	3,508
Tinian	2,631
Northern Islands	8
Total	**58,846**

Source: 1995 Census as reported by Stewart, 1997.

The creation of the Commonwealth of the Northern Mariana Islands marked a major step forward for the Northern Marianas both politically and economically. The adoption of a legislative democracy under the U.S. rule of law helped provide the stability necessary to move the Northern Marianas into an unprecedented era of economic expansion. The Commonwealth Covenant exempted the CNMI from U.S. control over immigration, wages, and customs. This made it easy for investors to import alien labor without U.S. immigration controls and at low minimum wages set by the Commonwealth government.

The CNMI economy has experienced significant growth followed by significant decline during the past ten years. The proximity of the Commonwealth of the Northern Mariana Islands to Japan and other Asian countries combined with its natural tropical beauty made the CNMI a prime location for the establishment of a tourism-based economy during the 1980's and 1990. As a result, the economy of the CNMI is closely linked to the economies of Japan, Korea, and China. When the Asian currency crisis unfolded in the late 1990's the CNMI was in a highly vulnerable position. Suddenly, the cost of business operations for Asian companies operating in the CNMI skyrocketed as the US dollar grew stronger against Asian currencies. This also impacted tourists because their currency no longer had the purchasing power to afford them trips to the CNMI. The results were dramatic. A drastic decline in tourism occurred, which resulted in declines in tourism service industries such as hotels and restaurants, retail trade, construction, and other services.

Table 1.3: Visitor Arrivals in the CNMI

Year	Arrivals
1990	417,146
1991	424,459
1992	488,330
1993	536,263
1994	583,557
1995	654,375
1996	721,935
1997	726,690
1998	526,298
1999	491,602
2000	526,111

Source: Stewart, 1997 and Marianas Visitors Authority

The Asian economic crisis has had a clear impact on visitor arrivals in the late 1990's. From the peak in 1997, visitor arrivals have fallen to 491,602 in 1999 but rebounded slightly to 526,111 in

2000. Though visitation rates are showing some signs of improvement, the tourism sector of the CNMI economy is still in a depressed state.

Due to favorable labor, customs, and immigration laws, a thriving garment manufacturing industry has developed in the CNMI. Garments manufactured in the CNMI by foreign companies utilizing foreign labor are allowed to bear the made in the USA label. Table 1.4 presents evidence of the importance of the garment and tourism sectors in the economic expansion of the CNMI by reviewing data on total wages and salaries paid by the private sector in 1995. The garment industry has the highest value of private sector wages paid. The retail, construction, and hotel sectors, all of which are closely related to tourism, follow the garment sector.

Table 1.4: Total Wages and Salaries Paid by the Private Sector in 1995 ($ millions)

Sector	Wages paid
Petroleum	0.23
Wholesale	3.9
Banking and Finance	4.37
Hotels	19.83
Construction	29.87
Retail	46.52
Garment Manufacturing	72.96
All Others	132.73
Total	**310.4**

Source: Stewart, 1997.

The economic boom fueled by the expansion of tourism and garment manufacturing did not result in a boom in the fisheries sector. Census data presented in table 1.5 shows that of the 34,723 individuals employed in the CNMI only one tenth of one percent, or about 50 workers, were employed in the combined industries of Forestry and Fishing in 1995. Thus, during the boom times of the 1990's domestic fisheries contributed only a very small portion of employment activity in the CNMI.

Table 1.5: 1995 CNMI Industrial Employment by Selected Activity

Industry	Employment	Percent of Total
Apparel	7,286	21
Other Activities	7,193	20.7
Other Services	5,676	16.3
Construction	3,478	10
Other Retail	3,296	9.5
Hotel and Motel	2,602	7.5
Eating and Drinking	2,130	6.1
Private Household	2,122	6.1
Wholesale Trade	513	1.5
Agriculture	377	1.1
Forestry and Fisheries	50	0.1
Total	**34,723**	**100**

Source: 1995 Census as reported in Stewart, 1997.

The boom in the CNMI economy came to an abrupt end in late 1997. Asian currency markets went through a devaluation crisis that caused economic downturns in most Asian countries.

Since the CNMI depends heavily on Asian tourism and foreign investment from Asian countries the CNMI economy experienced a severe contraction that appears to be continuing. Table 1.6 shows how business gross revenue and the value of wages and salaries paid in the Commonwealth have changed since 1997. One can see that 1999 business gross receipts have fallen by over fifteen percent from their peak in 1997. Year 2000 business gross receipts totals are not yet available. However, the total received through the first three quarters of 2000 is only $1.476 billion (CNMI Department of Finance, 2001). Assuming that the average of the first three calendar quarters business gross receipts will be earned in the fourth quarter the 2000 BGR will be approximately $1.968 billion. Thus, year 2000 business gross receipts are projected to be twenty-five percent less than peak receipts of 1997 and are projected to have fallen by eleven percent from 1999 levels.

Table 1.6: CNMI Economic Indicators, 1990-2000 ($millions)

Year	Business Gross Revenue	Total Wages and Salaries Paid
1985	244.4	77.5
1986	318.8	97.8
1987	420.7	101.1
1988	613	105.2
1989	957.7	216.8
1990	1,173.1	265.9
1991	1,494.4	322.3
1992	1,439.3	364.3
1993	1,398.5	384.7
1994	1,452.8	415.4
1995	1,831.0	464.8
1996	2,224.5	515.8
1997	2,610.4	605.5
1998	2,238.1	556.6
1999	2,213.1	553.3**
2000 (projected)	1,968.4*	492.1**

Sources: CNMI Department of Finance and Office of Management and Budget

*Projected from reported BGR for the first three calendar quarters of 2000 by assuming the average of the first three calendar quarters will be earned in the fourth calendar quarter.

** Projected by multiplying BGR by the long term average percent of BGR that the value of total wages and salaries paid has represented. The long term average from 1985-1998 is 25%.

The value of wages and salaries paid in the CNMI represents aggregate consumer income, which is a prime determinant in consumer demand for retail products. Wage and salary data presented in table 1.6 shows that the value of wages and salaries paid fell by about eight percent from 1997 to 1998. Although 1999 and 2000 data on wages and salaries paid is not available it is possible to project values for those years by assuming they are equal to the percent of BGR that wages and salaries have historically represented. The value of wages and salaries paid in the CNMI has averaged twenty-five percent of business gross receipts from 1985-98. Multiplying this percentage by 1999 and projected 2000 BGR yields $553.3 and $492.1 million in wages and salaries paid for 1999 and 2000 respectively. Based on these projection the decline in wages and salaries from 1997 to 2000 may be as much as twenty percent.

The economic downturn of the CNMI has important implications for this research. As will be discussed in section 4.5, the local indigenous people are an important market for the current domestic pelagic fishery of the CNMI. The contraction in the economy may have resulted in contraction in employment and wages earned by local people. As a result, local demand for fisheries products may have declined. There has also been an increase in fish prices over the past several years that have likely been prompted by high fuel costs. The only way to fully assess the effect of income and price change on consumer demand is to conduct a formal economic analysis of consumer demand. Such an analysis requires considerable data and is beyond the scope of this study. What can be said is that the value of wages paid in the CNMI has fallen considerably since 1997 and that decline has likely had a negative impact on aggregate consumer demand.

1.4. FISHING HISTORY

The Northern Mariana Islands have a long fishing history. Indigenous people have been harvesting fish for subsistence use for centuries and continue to do so. The first formal commercial fishing development started around 1930 when the Japanese began establishing fishing bases in their Western Pacific possessions. In 1940, a pole and line fleet of 37 vessels with 630 crew members landed 3,379.05 metric tons (7,433,910 lbs.) of skipjack tuna and another 84.51 metric tons (185,922 lbs.) of other tuna on Saipan. (Uchida, 1983). However, the onset of the Second World War and the eventual liberation of Saipan by U.S. forces destroyed the Japanese fishing fleet based there (Uchida, 1983).

Following the war, six fishing vessels scuttled by the Japanese were refloated and this fleet succeeded in harvesting 321,634 pounds of skipjack tuna in August of 1945. After the war, the territorial government turned these vessels over to a fishing cooperative that had failed by 1950 (Radtke and Davis, 1995). Little commercial fisheries development occurred in the Marianas from that time into the early 1960's.

In the early 1960's and through the 1970's, Japanese longline and pole and line vessels (baitboats) operated in the waters of the CNMI (Polovina and Shippen, 1983). Japanese longline vessel harvests peaked in 1977, when a total of 1377 metric tons (3,035,762 lbs.) of tunas were harvested. The average harvest of all species of tuna by Japanese longliners operating in NMI waters from 1965-79 was 343 metric tons (756,185 lbs.) Japanese longline billfish harvests peaked in 1970 at 190 metric tons (418,878 lbs.). The average billfish harvest was 80.53 metric tons (177,538 lbs.) and the average within 50 nautical miles of the Northern Marianas was 13.2 metric tons (29,101 lbs.) (Polovina and Shippen, 1983).

Available data indicate that Japanese pole and line vessels operated from 1970-79. In 1971, Japanese pole and line vessels harvested 12,564 metric tons (27.698 million lbs.) of tuna in the waters surrounding the NMI. The 1971 harvest was the largest recorded. The average harvest by Japanese pole and line vessels during the 1970's was approximately 6658 metric tons (14.678 million lbs.). The low harvest was 2553 metric tons (5.628 million lbs.) and occurred during the 1976 season when the lowest level of effort was expended (Polovina and Shippen). The presence of the Japanese fishing fleet in NMI waters was halted in the early 1980's when the U.S. Government and the CNMI Government both established a 200-mile Exclusive Economic Zone around the Northern Marianas.

During the post war era, domestic commercial fisheries were slow to develop and have not achieved Japanese harvest levels of the 1970's. The domestic fishery that has developed is primarily a small boat troll fishery (CNMI-DFW, 1995). However, the small boat fleet has

expanded considerably in recent years. In 1995, the CNMI Division of Fish and Wildlife reported that 87 vessels were involved in full-time commercial fishing, 69 were involved in part-time commercial fishing and 33 vessels were registered as charter vessels. In addition, 301 vessels were classified as subsistence fishing and/or recreational use in 1995 (CNMI-DFW, 1995).

A fishing cooperative was established on Saipan in the early 1990's. The cooperative occupied a building at the Garapan fishing base on Saipan. By 1995, the cooperative had failed reportedly due to management difficulties (Radtke and Davis, 1995).

Available domestic harvest data for the years 1979-98 show that the primary species harvested in this fishery is skipjack (*katsuwonus pelamis*) followed by mahimahi (c*orpyhaena hippurus*) and yellowfin (*thunnus albacares*). The average annual harvest of skipjack was 118,940 pounds, which represents seventy-two percent of the total average annual harvest of all species. Mahimahi (c*orpyhaena hippurus*) was the second largest component (nine percent) of the total harvest with an average annual harvest of 14,296 pounds. Yellowfin averaged seven percent of the total harvest with an average annual harvest of 11,729.

Table 1.7: Historical Comparisons of Pelagic Harvests in the waters of the CNMI

ERA	YEARS	HARVEST	HARVEST METHOD
Pre WWII	1940	7.6 million pounds	Japanese Pole and Line
Post WWII	1946-60	Amount unknown	Local Subsistence Fishing
Pre 200-mile EEZ	1965-70	Annual Average of 741,487 lbs.	Japanese Longliners
Pre 200-mile EEZ	1970-79	Annual Average of 15.8 million pounds	Combined Japanese Longline and Pole and Line
200-mile EEZ	1979-1996	Annual Average of 162,886 pounds	CNMI Domestic Troll Fishery. (CNMI-DFW Data)
Present Day	1998	Total Pelagic Harvest of 192,568 pounds	CNMI Domestic Troll Fishery. (CNMI-DFW Data)

Table 1.7 illustrates that recent harvests are significantly lower than historic harvests. The 1979-to-present average domestic harvest of 162,886 pounds is only slightly greater than one percent of the 15.8 million-pound average harvest of Japanese vessels during the preceding period. It is also only twenty-two percent of the 741,847-pound average harvest of Japanese longliners during the period from 1965-70. Thus, recent harvests by the CNMI domestic troll fleet do not seem to represent the true pelagic species harvest potential within the EEZ adjacent to the CNMI.

1.5. PELAGIC STOCK CONDITIONS

In 1999, the Oceanic Fisheries Program of the Secretariat of the Pacific Community (SPC) conducted the "Mariana Islands 1999 Pelagic Fisheries Assessment." The assessment provides a

comprehensive review of regional oceanography and pelagic species biology. The assessment reviews existing fisheries and provides conclusions on fisheries potential as well as fisheries management considerations. Only the key points made in the assessment that are of most interest to this study are reviewed here.

The SPC utilized confidential logbook data to spatially aggregate pelagic catches in the Western Pacific region adjacent to the Exclusive Economic Zones (EEZs) of Guam and the CNMI. The assessment also reviewed the biology of pelagic species to determine stock structures, distributions, and population dynamics via population models developed at SPC. The conclusion reached by the assessment was that available stocks could support an increase in skipjack tuna catch in these EEZs. The SPC population model predicts that skipjack harvests of 18,000 metric tons (39.7 million pounds) in the EEZs of Guam and the CNMI could be supported by available stocks. They estimate that about seventy-seven percent, or 13,900 metric tons, of that total are available to the fishery in the CNMI. However, the assessment points out that historic harvest levels in the region suggest that the actual yield in the EEZs of Guam and the CNMI would only be around 7000 metric tons annually. Thus, approximately 5400 metric tons of that harvest could reasonably occur in the CNMI EEZ if effort levels were sufficient to harvest that quantity. These catches will be geographically variable due to climatic conditions such as the El Nino Southern Oscillations (ENSO) events that periodically occur in the Pacific.

Estimated annual pelagic harvests using data from the CNMI Division of Fish and Wildlife dealer invoicing system are only around 90 metric tons annually (WRPFMC, 1999). Thus, the current pelagic harvest represents only about two percent of the skipjack harvest that the SPC predicts could be supported by available stocks. Based on the findings of the SPC fisheries assessment, the skipjack fishery of the CNMI is not stock constrained.

The SPC fisheries assessment did not estimate yellowfin and bigeye tuna stock availability in the region. However, the assessment indicated that yellowfin stocks are considered healthy. Bigeye stocks were categorized as uncertain due to poor scientific knowledge of stock structures, uncertainty in bigeye catches in purse seine sets (e.g. bigeye are often reported as yellowfin) and uncertainty in basic biological parameters.

The health of yellowfin and bigeye tuna stocks in the region is clearly important to developing fisheries that exploit those stocks. However the findings of the assessment suggest that oceanographical conditions may have more effect on the potential for developing a longline fishery in the CNMI than stock conditions of yellowfin and bigeye tuna. Whereas skipjack tuna are generally surface swimming and readily harvested by troll, purse seine, and pole and line vessels, yellowfin and bigeye tuna have a much broader vertical distribution in the water column that is limited by levels of dissolved oxygen. If dissolved oxygen levels are low at deep depths and decrease with depth then the vertical distributions of yellowfin and bigeye are constrained to shallower depths where high levels of dissolved oxygen are present. In contrast, if dissolved oxygen levels are high at deep depths then the vertical distribution of yellowfin and bigeye is not constrained to shallow depths.

The distribution of dissolved oxygen and its effect on the vertical distribution of yellowfin and bigeye tuna has important implications for catchability in longline fisheries. The SPC fisheries assessment provides an analysis of dissolved oxygen and thermocline depth in the waters of Guam and the CNMI and shows that both exhibit a latitudinal gradient in the region. Latitudes south of 12°N have less dissolved oxygen at a given depth than more northern latitudes in the region. Latitudes north of 12°N were found to have generally high levels of dissolved oxygen at

depths down to 300 meters. The thermocline in the region follows a similar pattern with greater thermal diffusion (75 to 275m) north of 12°N.

According to the SPC assessment, the oceanographic conditions present in the Marianas imply that the catchability of yellowfin and bigeye tuna will be lower in the more northern latitudes of the region, or around the Northern Mariana Islands, as opposed to the more southern latitudes near Guam. Further, catchability will likely improve in waters farther south, such as in the EEZs of Palau and the Federated States of Micronesia. This is because it is harder to locate the fish in the more northern waters of the region as they are distributed more widely in the water column.

Another factor in assessing fish stocks in the region is the localized rate of primary productivity. Primary productivity of the ocean is defined as the growth rate of phytoplankton, which provide the food energy input necessary for the development of fish. Primary productivity is directly related to secondary productivity, which determines forage availability for tunas. The SPC assessment found that these productivity measures were highest in the equatorial western Pacific (e.g. near Palau, and the Federated States of Micronesia) and the tropical eastern Pacific. However, the assessment found that oceanic waters in the EEZs of the Marianas are relatively low in productivity. Thus, the forage available for tunas appears to be constrained in the waters adjacent to the Marianas as compared to other parts of Micronesia.

As a result of the oceanographic conditions that exist in the region, the SPC fisheries assessment came to the following conclusions regarding longline fishery potential productivity.

> *Yellowfin and bigeye catchability will be greater in Guam EEZ compared to the CNMI EEZ, due mainly to a shallower and steeper thermocline and low oxygen concentrations at depth….there will be localized affects such as increased productivity near islands or banks. The Mariana Islands EEZs are less attractive to longline fishing than its Micronesian neighbors to the East and South.*

Based on the finding of the SPC assessment, it appears that the waters adjacent to the CNMI can yield significantly greater catches of skipjack tuna. However, it appears that longline fishing for yellowfin and bigeye tuna will be less successful than in waters near Guam and further south in the EEZ of the Federated States of Micronesia.

1.6. POTENTIAL FOREIGN FISHERIES DEVELOPMET

In 1996, the U.S. Congress amended the Magnuson-Stevens Fishery Conservation and Management Act to provide special foreign fishing provisions for the CNMI, Guam, American Samoa, and the U.S. owned pacific islands (US-DOC-NOAA, 1996). The CNMI government is in the process of preparing a Marine Conservation Plan in order to allow foreign fishing in the waters of the CNMI. Based on the history of commercial fishing in this region, it is anticipated that Asian countries such as Japan, Korea, Taiwan, and China would be those most interested in gaining foreign fishing access to CNMI waters. It is possible that Asian fishing nations may express some interest in longline fleet access to the waters of the EEZ adjacent to the CNMI. In fact, the CNMI has been contacted by a company from Thailand that is interested in investigating the possibilities of conducting a test fishery for pelagic species to assess harvest potential before entering into a fishing agreement (pers. comm. Miller, 2001). However, the intensity of Asian distant water fishing nation interest and their willingness to pay for longline fleet access is unclear. The condition of Asian economies and their currency value with respect to the U.S. dollar may be limiting factors in establishing a foreign fishery in the waters of the CNMI. It is

also true that these countries may express interest while arguing for lower fees due to their reduced ability to pay.

1.6.1. Potential Foreign Fishery Revenues

Access to the Exclusive Economic Zones of Pacific Island nations is usually granted to foreign nations under fee-for-access arrangements. The fee usually ranges between three and five percent of the gross landed value of the fish harvested (Hunt, 1997). However, the gross landed value of the fish depends heavily on the species, fishing method, and potential markets. In point of fact, the fees paid will be negotiated by the U.S. State Department with the CNMI Governor's concurrence and may be in the form of a flat fee and not necessarily a percentage of harvest value royalty. It is also not clear at this time whether the fees would be paid up front for the entire three years of the foreign fishing agreement or on an annual basis. It is also true that foreign fishing operations will be required to pay for observers and vessel monitoring systems. Thus, it is not currently known what level of foreign fishing revenues the CNMI might earn if a foreign fishery were opened.

Although it is not clear what type of foreign fishery would develop, the SPC fisheries assessment of the Mariana Islands estimated that local harvests of skipjack tuna could conceivably be about 5,400 metric tons. The current cannery grade price for skipjack tuna is $400 per metric ton (Casamar, 2000). If this price were received and 5400 metric tons were harvested by foreign vessels the fishery would generate about 2.16 million in total revenue. A five percent royalty on that revenue would provide only around $110,000 in revenue to the CNMI government. Further, a foreign skipjack fishery may have significant impact on stock available to local pelagic fishing vessels. Thus, it is not clear that developing a foreign skipjack fishery would provide significant economic benefit to the Commonwealth. Further, the findings of the SPC fisheries assessment suggest that foreign longline operations that target yellowfin and bigeye tuna may not be viable in the CNMI.

The SPC Fisheries Assessment evaluated the potential for development of foreign fishing in the region and made the following statement.

> *The Mariana Islands have little advantage in attracting foreign fleets due to : 1) reduced catch rates, 2) EEZ size, 3) extensive regulations on foreign fishing, 4) potential negative interactions with other fishery sectors*

The SPC assessment also finds that catchability constraints and regulatory structures limit foreign fishing potential in the EEZ of the CNMI.

1.7. STATEMENT OF THE RESEARCH QUESTION

The previous discussions have shown that the waters of the CNMI have historically yielded substantial harvests of tunas and other pelagic species. However, the current harvests of the CNMI domestic fishery fall short of historic levels. Recent amendments to U.S. Federal law allow foreign fishing revenues to accrue to the CNMI thus creating a potential revenue source. However, the amount of revenue that might be earned by the CNMI is uncertain.

Many of the island nations of the Western and Central Pacific currently receive foreign fishing royalties. However, some island nations have begun to question the true value of these royalties in comparison to the total value of the fishery. In many island areas, foreign fishery royalties

have not created jobs or prompted local economic development in ways that a local domestic fishery would have. The experiences of the island nations of the Western and Central Pacific are a lesson to anyone considering opening a foreign fishery. The lesson seems to be that greater effort to expand domestic capacity and eliminate the perceived need for foreign fishing is warranted.

In the CNMI this lesson raises several questions. Why hasn't domestic capacity expanded to achieve historic harvest levels? Why hasn't this apparently underutilized fishery experienced any entrance by U.S. vessels operating in other areas of the Western and Central Pacific Ocean? Are there barriers to entry and, if so, can they be overcome? Are there barriers to domestic fisheries development and, if so, can they be overcome? What measures can be taken to expand the domestic fishery to provide sustainable domestic utilization of the fishery resources of the CNMI? Thus, the research problem is to determine how the domestic fisheries of the CNMI can be sufficiently developed in order to eliminate any need, perceived or real, of allowing a foreign fishery.

2.0 PROJECT GOALS AND OBJECTIVES

The goals of the project are to determine why domestic fisheries have not developed to fully utilize the pelagic fishery resources of the CNMI and to determine ways in which domestic fishery development might be furthered. The ultimate goal is to identify methods that, if undertaken, will expand capacity, reduce costs of production, expand and/or identify markets, and promote feasible value-added processing of fishery products.

The objectives of this project have been broken down into seven components that are believed, a priori, to be crucial to domestic fisheries development. These objectives are as follows

1. Develop focus group(s) of domestic fishermen and develop domestic capacity database.
2. Collect vessels cost of production and earnings data and assess production efficiency.
3. Identify economic conditions in the fishery labor market.
4. Identify domestic and foreign market constraints that may be hindering domestic fisheries development and determine ways to expand access to markets.
5. Identify local infrastructure constraints that may be hindering domestic fisheries development and determine what changes would be necessary to further domestic fisheries development.
6. Identify financial and legal constraints on expansion of domestic commercial fishery development and identify potential ways to expand financing opportunities based on successful programs used in other fisheries.
7. Make CNMI government officials, Federal officials, and domestic fishermen aware of the findings of the study via dissemination of the final report and via presentations of findings.

3.0 METHODOLOGY

3.1. COMMERCIAL FISHING FOCUS GROUPS

The concept behind creating focus groups of fishermen for this study was based in the belief that effective fisheries development and fisheries management programs must utilize a participatory approach. These programs must include, and in fact actively solicit, direct participation and input from stakeholders. The stakeholders of interest for this study are the fishermen actively participating in the domestic pelagic fishery of the CNMI. The challenge to involving these stakeholders is getting them to participate in some form of meetings so that their input can be noted and their participation in future fisheries policy deliberations can be fostered. In this study,

attempts were made to develop focus groups on each of the three islands in the study. As is detailed below, success was limited both by participation and group communication dynamics. The methods and results of focus group creation on each island are discussed in turn below.

3.1.1. Saipan

Public meetings in Saipan have a history of low attendance unless the topic is of broad community interest or is a crisis situation. For this reason, it was expected that creation of focus groups in Saipan would be difficult. To mitigate the expected difficulty, focus group creation on Saipan began with informal discussions with fishermen at venues such as the Western Regional Fisheries Management Council's fisheries management plan development meetings. Two of these meetings were held during the initial months of the study and attempts were made to meet with fishermen informally at the end of the meetings. This informal approach was used so fishermen would gain familiarity with the principal investigator and as a means to create working relationships. It was hoped that these informal venues might foster an element of trust in the principal investigator and generate interest in the work of the study. Unfortunately, formal meetings did not garner sufficient participation. As a result, the principle investigator decided to engage fishermen at dockside.

3.1.2. Tinian

Focus group creation on Tinian was much more successful than on Saipan. Intercept interviews were initially conducted on Tinian during the week of November 1-5, 1999. During that time two separate groups of fishermen met informally with the PI at dockside after returning from fishing for the day. The PI was invited to attend a meeting of the local sport fishing association and was given the opportunity to speak with approximately 25 additional fishermen. In addition, a formal focus group meeting was scheduled for Friday, April 14, 2000. Henry Cabrera of the Tinian office of the Division of Fish and Wildlife provided considerable assistance with planning the meeting and notifying local fishermen. The venue for the Tinian focus group meeting was a local beach facility and the PI and Mr. Cabrera hosted a barbecue. Approximately 20 individuals attended the barbecue event.

3.1.3. Rota:

Intercept interviews began on Rota during the week of November 29 through December 3, 1999. Unfortunately, the weather during that period of time was quite rough and only a single intercept survey was conducted. Attempts to organize a formal focus group meeting with the assistance of the local office of the Department of Lands and Natural Resources were not successful. Despite conducting only one interview, the PI was able to hold a small impromptu meeting with the assistance of the one fisherman interviewed. Input was gathered from approximately five individuals during that meeting.

A second trip to Rota was made to hold further meetings with fishermen and attempt to conduct intercept interviews. Only one successful intercept interview was conducted during that trip. It is believed that this is due to very low participation numbers in the fishery. Though only one intercept interview was conducted, individual focus meetings were held with approximately ten people actively involved in fishing. Many of these meetings were possible due to the considerable assistance of the Rota office of the CNMI Department of Commerce. These focus meetings provided a large amount of information on the fishing situation in Rota.

3.2. CAPACITY DATABASE

A goal of this study was to create a domestic pelagic fishery capacity database. The idea behind this was to attempt to identify those vessels in the CNMI that are potential pelagic commercial fishing vessels and to assess their productive capacity. This analysis was also designed to define the intercept interview potential population in order to gain some understanding of dimensions of the survey frame. Unfortunately, due to data constraints, this approach was merged with the intercept interview methodology discussed in the following section.

3.3. COST AND EARNINGS

The target group for this study was vessels that are engaged in commercial fishing for pelagic species. Intercept interviews were conducted to collect data on vessel costs of production, harvest, and earnings. The approach was patterned after a similar study recently conducted on the Hawaii small boat fishery (Hamilton and Huffman, 1997). However, the approach used in the Hawaii study was expanded considerably to meet the objective of the present research.

The intercept interview format used in this study was quite expansive and was designed to collect as much data as possible on the vessels, vessel operators, fishing trips and crew of commercial and recreational pelagic fishing vessels operating in the CNMI. The format of the interview was to collect operator- and vessel-specific data. The interview then shifted to trip-specific data before determining whether the vessel intercepted was recreational or commercial. Commercial operators were asked an additional set of questions on their commercial operations. The complete interview form is included in Appendix A.

The interview began with a series of operator-specific questions on age, education, experience and vessel ownership and use. These questions were followed by questions on vessel characteristics such as size, horsepower, facilities, and equipment. These questions serve to quantify vessel equipment characteristics and provide economic values of investment in fishing capacity. The interview also collected data on elements of fixed vessel costs such as insurance, loan finance and maintenance.

Vessel specific questions were followed by a series of trip specific questions. Information was gathered on variable input expenditures such as ice, bait, gear, fuel, oil, and food. Information on trip timing, trip length, location, species targets, and harvests were collected next and were followed by questions on perceptions of commercial fishing, and self-definition of fishing behavior as commercial, recreational or subsistence. Income and employment information was then collected.

Trip-specific data were collected to establish variable trip costs and returns by trip. This data was collected for the trip on which the intercept occurred and on the most recent prior trip the operator had taken with the vessel. By merging the vessel- and individual-specific data with the trip data for each interview, two complete trip observations are recorded for each vessel. It is possible that recall bias may be an issue with data on prior trips. However, the potential for this problem is not so great for the vessels self-categorized as full-time commercial fishing vessels. These vessels report taking multiple trips per week and did report different variable costs and returns for the two trips. The potential for recall bias for the vessels that were self categorized as part-time commercial may be a greater concern because these vessels take fewer trips so the time between trips is greater. Hence the ability of the part-time fishermen to accurately recall trip specific data for a trip taken in the past may be questioned.

The general interview concluded with questions on use of harvest, fishing method used, and comments about fisheries development and management. Operators were asked whether they ever sell any fish. If the response was yes the interview continued with commercial questions. If the respondent indicated that he doesn't ever sell fish the interview was complete and the vessel was classified as recreational.

The commercial portion of the interview starts by eliciting information on commercial sales behavior and price expectations. Questions follow on sales percentages and method of fishing. Crew specific data on payment method, experience employment status and education are also included. Information is then gathered on fish handling methods, market usage, and market strength. Questions on gross sales and extent of operator household income earned from fishing complete the commercial portion of the intercept interview.

The interview format was pretested beginning in October of 1999. Initial results showed that questions regarding ethnicity of operators and crew created difficulties. Several respondents reacted negatively to identifying the ethnicity of themselves and especially their crew. As the negative reactions were rather strong and ethnicity is not a central focus of this study, ethnicity questions were removed from the interview form. Other studies have covered the topic sufficiently.

Another difficulty found during pretests was a general unwillingness of fishermen to allow a viewing of their actual catch. Fishermen were generally willing to participate in the intercept interview but they balked at a creel survey for their catch. This trend was particularly noticeable if other fishermen were within a distance that would allow them to view the catch. As a result of these difficulties, the harvest questions were generalized somewhat to species groups of pelagic, bottom fish, and reef fish rather than trying to gather a list of actual species harvested. Fishermen were simply asked how many pieces and their estimation of the number of pounds of each kind of fish they had caught on the trip.

3.3.1. Intercept Method

An intercept interview method was used to interview commercial fishermen engaged in fishing for pelagic species. Stratification of potential respondents was accomplished by the limiting the time of day that the interviewer went to dockside to conduct interviews. It is well known locally that pelagic boats use a rod and reel or handline trolling method. In addition, most do not utilize any kind of organic bait but rely instead on plastic squid skirt lures. This type of fishing is a daytime operation so interviewer time at dockside was limited to daylight and early evening hours when intercepts of pelagic boats were most likely to occur. However, verification of the appropriateness of this stratification was accomplished by observation during frequent visits to marinas and boat ramps at various times during the day.

It is important to note that all vessels intercepted were trailered vessels. This stratification was not intentional and several attempts were made to intercept vessels that are permanently moored at the Smiling Cove and Outer Cover Marinas. However, activity levels among moored fishing vessels, excluding charter vessels, were observed to be quite low.

There are three primary intercept sites on Saipan, one on Tinian and one on Rota. On Saipan, the choice of site for the interviewer to concentrate efforts on was accomplished by morning and midday counts of boat trailers at the site. It was quickly determined that one site, Smiling Cove Marina boat ramp, was rarely used by commercial pelagic fishing boats. It was observed that the

Smiling Cove ramp is used primarily for commercial passenger and tour boats as well as small reef fishing boats departing late in the evening to set nets in Saipan Lagoon. On weekends recreational fishermen use the Smiling Cove ramp. As a result, few commercial pelagic vessel intercepts were recorded at Smiling Cove.

Another of the sites on Saipan, Garapan boat ramp, also exhibited limited usage by commercial boats. This was especially true during times of low afternoon tides. Fishermen complained that both Garapan ramp and Smiling Cove ramp are too shallow at low tide for safe launching and retrieval of boats. In addition, many fishermen sell fish at dockside at Sugar Dock ramp but such selling was not observed at Garapan ramp or Smiling Cove ramp. Thus, Sugar Dock ramp emerged as the primary site on Saipan for intercept interviews. However, the other ramps and Smiling Cove marina were routinely checked for activity throughout the study and intercepts did occur at each of these sites.

Data Integrity

This study has utilized strict data controls to maintain data integrity. The intercept interview used for this study was quite detailed and of an economic nature. To ensure consistency and quality in the data collection, the PI conducted all interviews. It has been suggested that assistance should have been sought from the CNMI Division of Fish and Wildlife. However, much of the interview work was conducted after normal working hours. Further, fishermen expressed mistrust of government so the presence of CNMI-DFW staff during interviews where economic data was collected would be of questionable benefit.

All intercept interview data have been kept strictly confidential. Completed interview forms were immediately entered into a computerized storage media and hard copies were filed in a locked file cabinet. Data entry and analysis was conducted on a secure stand-alone laptop computer with daily backups to disk media. The computer and backup media were either in the possession of the PI or stored in a locked office at all times during the study. To maintain confidentiality, names, contact information, and vessel identification information has been removed from the intercept interview forms and was not entered into the computerized database. Under no circumstances will respondent identification be linked with the data collected in this study.

Statistical Note

This study has made use of limited statistical tools. The statistics presented in tables throughout this report have been purposely limited to averages, standard deviations, medians, minimums and maximums. They are intended to be descriptive in nature and are not formulated to test hypotheses. Limitation of statistics in this way is necessary given the limitations of the data and the audience this report is intended to appeal to. It may be possible to utilize the data for more advanced econometric study. Additional econometric analyses were proposed in the original grant application, however they were removed at the request of the granting agency largely due to concerns over data availability and quality.

3.4. LABOR MARKET CONDITIONS

The intercept interview included survey questions designed to determine the nature of the labor decisions made by CNMI fishermen. Of critical importance is to establish whether fishermen are full or part-time commercial fishermen and whether they participate just to cover costs of recreational fishing or to earn primary or secondary income. In addition, dockside focus meetings

were used to determine what drives labor choices of CNMI fishermen. Results of the labor analysis are discussed in section 4.4.

3.5. MARKET CONSTRAINTS

An extensive analysis of the Saipan seafood markets was conducted in 1993. The report "Analysis of Saipan's Seafood Markets" was released in 1995. The analysis presents the results of a market survey estimates local seafood demand as well as price sensitivity. This study has not attempted to duplicate that recent work and will rely on the findings of that analysis to define situations in the local seafood market and compare those findings to data gathered during the interviews. Readers interested in more detailed information should consult the market study directly. Results of a comparison between the current study and the "Analysis of Saipan's Seafood Markets" are presented in Section 4.5.

3.6. INFRASTRUCTURE CONSTRAINTS

To assess potential infrastructure constraints, the principle investigator traveled to each of the three islands to inspect and evaluate all available infrastructure facilities. Information was also collected from the Commonwealth Ports Authority and from various studies on proposed infrastructure enhancement for the three islands. Data for the CNMI were compared with information and onsite evaluation of available infrastructure on Guam. Results of this analysis are presented in Section 4.6.

3.7. FINANCIAL AND REGULATORY CONSTRAINTS

Fisheries development depends on the presence of favorable legal and financial conditions. Tax incentives, low interest loans, and moorage subsidies are all examples of favorable development circumstances. This task assessed the state of such conditions in the CNMI and evaluated whether there are any financial and legal obstacles to domestic fishery development. Data was collected by reviewing existing and proposed CNMI laws and regulations, federal laws and regulations, and international treaty activities. The principal investigator also researched ongoing legal actions.

Finance information was collected from representatives of the Commonwealth Development Authority. In addition, a telephone survey of commercial lenders was conducted. The survey methodology consisted of contacting loan managers via telephone to ask a series of questions on their lending requirements and practices. The list of potential lenders was taken from yellow pages telephone listings, which yielded approximately 15 potential lenders. Of these, one had ceased operations, one was a duplicate listing under a different name, and four indicated that they did not offer commercial loans. Attempts were made to contact each of the remaining 9 lenders. Five lenders were contacted and four did not return phone calls.

Each loan manager was asked whether their institution offers commercial fishing vessel loans. If they replied in the affirmative they were asked what collateral they require and whether the vessel is used as collateral. They were also asked to about their requirements for vessel insurance, loan terms, and whether a business plan is required. The results of this regulatory and finance review are presented in Section 4.7.

3.8. PROJECT MANAGEMENT

This project was undertaken, in its entirety, by the principal investigator, Scott A. Miller. Mr. Miller is an Agricultural and Resource Economist and currently holds the position of Natural Resource Conservation Scientist with the Northern Marianas College, Commonwealth of the Northern Mariana Islands, Cooperative Research, Extension, and Education Service. Mr. Miller is also the Program Leader of the Agricultural and Resource Economics Program within NMC-CNMI-CREES. Administrative staff within the Northern Marianas College provided Grant administration and federal accounting. Various staff of the Division of Fish and Wildlife, the Rota office of the Department of Commerce, the Department of Finance, the Commonwealth Port Authority, and the Commonwealth Development Authority provided additional assistance.

4.0 FINDINGS

Each of the major objectives of this study has been analyzed following the methodologies described previously. The findings of investigations and analyses used to address these objectives are discussed in the following sections. Included with findings of each objective is a discussion of particular problems that arose while conducting the research. Also included are conclusions that can be drawn from the research as well as recommendations for additional work to address issues raised in the analysis. This format is used in order to comply with National Marine Fisheries Service, Saltonstall-Kennedy program report format requirements.

4.1. FOCUS GROUPS

This study collected fishermen input via three distinct methods; informal focus meetings at dockside, formal focus meetings, and vessel operator intercept interviews. Table 4.1 shows the participation rates in formal and informal focus meetings held during the study period. The informal dockside method of eliciting fisherman input was much more successful than the formal focus group meeting method. Possible reasons for this will be discussed in section 4.1.

Table 4.1: Participation in Focus Meetings

Island	Formal	Informal	Total
Saipan	3	40	**43**
Tinian	20	37	**57**
Rota	0	15	**15**
Total	**23**	**92**	**115**

4.1.1. Accomplishments and Findings

The input received from stakeholders on each island is displayed below in paraphrases of the actual statement or statements made. It had been hoped that the formal focus groups structure would allow calculation of the percentage of fishermen who made these or similar statements or identification of consensus issues. However, formal focus groups were of limited success. As a result, the study relies on more informal discussions at dockside that are necessarily open-ended. Under these circumstances it is not possible to categorize the comments received without risk of misrepresentation. For this reason the statements are simply listed as noted in the field. The information is grouped by island to clearly identify unique situations in each area.

4.1.1.1. Stakeholder Input

The following statements are interviewer responses to the open-ended question "Do you have any suggestions concerning how the CNMI fisheries should be developed, managed, or studied?" These statements are paraphrases of actual statements made to the principle investigator. The term "FAD" refers to "fish aggregating devices." The term "CDA" refers to the Commonwealth Development Authority.

Saipan Stakeholder Input

- Need FADs, market is weak, need a fish processing and market complex like Hawaii and Palau, need a co-op and regulate like Palau so only local fishermen can fish, need to put on size restrictions and enforce them, there is too much guest worker reef fishing, there are no reef fish left for locals.

- The government should buy the fish so fishermen don't have to go door to door to sell them, imports of fish shouldn't be allowed.

- Market is the main problem, fishermen come in early to meet the market, need a central fish market, reef and bottomfish are over exploited, night SCUBA commercial fishing is a big problem.

- The price should be fixed and other fishermen shouldn't be allowed to lower their price. Imports of fish should not be allowed.

- Dealer invoices are not always picked up at the store, need a commercial fishermen's association, need a centralized market to buy and process the fish

- Need FADs, need better boat ramps--cannot use Garapan or Smiling Cove at low tide, need a fish buyer to buy the fish and sell them to the public.

- Need FADs, need better parking at sugar dock, need to keep jetski trailers out of Sugar Dock, need a market to sell everything at a set price.

- Improve the local market with a co-op that buys all of the fish all of the time

- Need to keep imports out, government needs to buy fish from fishermen at our price

- Need a central market with a buyer to buy everything we catch at a good price

- Need a fisherman's co-op market but not government run and we need FADs badly

- Improve the boat ramps, need an offloading area and selling area, need an export market, sugar dock channel needs to be dredged and lighted.

- Need a market to buy our fish so we don't have to lower our price to sell everything

- Roadside permits and fees (to sell fish) are too difficult

- Reduce the gas price it is killing us

- We need FADs
- Need a fish market so we don't have to compete at the dock
- Need a fish co-op--need one place to sell all the fish
- Boat ramps need repair and improvement for low tides, fuel is too expensive--need a (fuel) price cut for fishing boats, need dredging and lighted channel markers at sugar dock and Garapan
- Boating safety and civil defense need better GPS training for rescues, need a market to buy fish--if there were a buyer we could catch more than we can now, the problem isn't catching the fish it is selling the fish.
- Need a market to buy all the fishermen's fish at the fishermen's price
- Need to centralize the fish market, need some kind of processing facility that buys the fish and does the re-sale
- Need FADs, need better boat ramps--cannot use Garapan or Smiling Cove at low tide, need lighted channel markers at sugar dock.
- Survey commercial fishermen on harvests, look at revenue potential of licensing commercial fishermen, need FADs, roadside vendors need to be checked for food handling (certificates) and cleanliness.
- Get rid of big nets and get rid of guest workers out fishing the reef.
- We need more derbies and more FADS
- Net fishing is a big problem, they catch too small fish. Lagoon is too crowded with jetskis and parasail boats. Atulai don't come into the lagoon anymore because there are too many boats.
- Boat ramps can't be used at extreme low tide--they need to be fixed
- Need size limits on bottomfish--they are getting smaller and smaller
- Need FADs and better boat ramps
- Need better boat ramps and parking facilities

Tinian Stakeholder Input.

- Need facility for export
- Really need FADs
- Boat loans are too hard to get, many good fishermen can't get boats

- Need protected areas for bottomfish, need training for fishermen and bigger boats, need an export market

- Improve the market, need a market like Palau, government needs to support a fishermen's association.

- Need training on new equipment like fish finders and squid lights

Rota Stakeholder Input.

- If we were doing this commercially we wouldn't be doing it for long.

- We can catch more fish than we can sell, especially the bigger fish like wahoo and yellowfin because not many people want to buy a whole big fish.

- There isn't really a local market that will buy fish every day.

- You can always sell reef fish and bottomfish but tuna and wahoo and mahi are sometimes hard to sell.

- Up in Saipan they mostly catch skipjack but down here we can catch bigger fish like yellowfin but there isn't a market to sell it at.

- We have had trouble with Saipan fishermen coming down here and fishing and taking the fish back to Saipan to sell…..they shouldn't be allowed to do that.

- I would like to buy a bigger boat and think I can catch enough to cover costs and make a little but I would have to market outside of Rota…probably in Guam.

- Some of us are starting to try to export to fish markets in Guam but it is difficult because there isn't much cargo space. We also want to export mahi to Hawaii…we even have a buyer but the problem is that someone has to be in Guam to pick up the shipment from Freedom air and take it to Continental because they are in different terminals.

4.1.1.2. Focus Group Meeting Inputs

The following are paraphrases of statements made during the formal focus group meeting held in Saipan and during informal focus discussions held at dockside. These statements are not responses to a specific question but are general statements of concern made by fishermen with regard to their fishing operations.

Saipan Focus Group

- There should be a heavy tax on all fish imports

- Charter boats shouldn't be allowed to sell fish because they don't hold their price up.

- CDA only gives loans to relatives of its board or powerful people.

- It is too hard to do all the paper work for a CDA loan…..they even want us to file a loan application with a bank so that we can get refused first. They already know the banks won't give us a loan so why do we have to go through it.

- CDA doesn't give enough help on preparing a business plan.

- We could catch a lot more fish if there were a place to sell them. As it is now, we stop fishing when we have caught all we think we can sell in one evening. That is usually in the early afternoon so we could catch lots more. If we catch too much now we have to lower the price to sell them all in one night.'

- We haven't had FADs since the typhoon in 97.(super typhoons Joan and Keith) DFW should have had FADS back in the water for the next mahi season. Why can't they make an extra set of FADS and have them ready to go when we lose one? It's been four years almost and no FADS.

- This isn't commercial fishing really…..it is survival fishing…..everyone here is just trying to survive.

- Why do we pay liquid fuels tax for boat gas? Isn't the tax for roads? The government should give fishermen a break on the tax for boat gas.

Tinian Focus Group Meeting Input

- We can sell all our catch by going door to door….the key is to know everybody

- The only way to make it is to have your own store and supply yourself and control quality yourself.

- The market is the problem.

- We can't fish every day because the market gets filled up and people haven't used the fish they bought already. When that happens the fishermen eat the fish or give it away and they can't pay for fuel.

- We need a tender boat to buy our fish at sea so we can keep fishing….sometimes we catch too much and if it is rough we don't want to carry any more.

- We want a place where all of our fish is bought at our price and not on consignment.

- CDA should provide a market.

- We need a discount on fuel prices….a break on the taxes. Why is the tax the same for boats and cars?

- Government hours at the DLNR Farmer's and Fisherman's market don't work for us. We come in after they close but we need to sell our fish and we can't keep it overnight so we go door to door instead.

- The price at the DLNR Farmer's and Fisherman's market is too low….why should I take their price when I can go door to door and sell at my price?

- The DLNR Farmer's and Fisherman's market works on consignment so we don't get paid for our fish and they may not sell it. So, we don't get money for gas for the next trip. It is better to go door to door and sell what you can and eat the rest before it spoils…..if you leave it on consignment and it doesn't sell you cant even eat it yourself because it is spoiled.

- CDA financing is too difficult to get….the application and bank refusal are too hard…we don't have time to go to CDA to do the paperwork.

- CDA doesn't help with marketing once the loan is given out and they don't help with the business plan.

- We want federal boat loan assistance and federal assistance to rebuild the docks and breakwater.

- It used to be easier to catch a boatload of fish.

- Some fishermen don't take good enough care of fish so quality has been bad and the Dynasty imports fish because they don't like the local quality.

4.1.2. Problems Encountered

Virtually every fishermen intercepted was willing to discuss his fishing operations after completing the intercept interview. In addition, groups of fishermen would often participate in impromptu discussions at dockside and input was taken from these fishermen. After several months of developing these relationships, a formal Saipan fishermen's meeting was planned in late January. Fliers were posted announcing the meeting and public service announcements were sent to local media. The meeting was held at the local public library. However, not a single fisherman attended.

Following the failure of the first formal meeting, the principal investigator reverted back to the method of engaging fishermen in discussions at dockside. This continued for several more months in order to build more relationships with fishermen. Prior to attempting another formal meeting with fishermen the principal investigator attempted to publicize the study more widely to increase interest and support. The principal investigator prepared a press release that resulted in articles about the study being written in both of the local newspapers. In addition, the principal investigator participated in a local radio broadcast on the KSAI radio "Island Issues" show to explain the study. Following these media outreach activities, another formal meeting was scheduled. Prior to scheduling the meeting, the principal investigator spent several afternoons at dockside asking fishermen what day would be best for them. The nearly unanimous choice was Saturday evening. As a result a meeting was scheduled for the evening of Saturday, May 6th at the local library, which was the most centrally located site available.

In the days prior to the meeting, the PI canvassed the docks, boat launches, roadside fish sellers, and a tackle stores on Saipan to hand out and post fliers inviting fishermen to attend the meeting. A total of 200 fliers were handed out, put on car windshield at boat ramps, or posted in conspicuous locations near marinas and boat ramps. The result was only slightly better than the

first attempt as only three fishermen attended. However, these three attendees provided useful input.

Given the limited success of these focus group meetings in comparison to dockside discussions with fishermen, no further attempts were made to hold formal focus group meetings on Saipan. The evidence suggests that this type of venue is not currently feasible on Saipan. In contrast, formal focus group creation on Tinian was successful and individual focus meetings were arranged on Rota with the assistance of the Rota Department of Commerce office and were also successful.

4.1.3. Conclusions and Recommendations

After discussing the attendance situation with several fishermen, some conclusions were reached. First and foremost was that after spending a day on the water, fishermen did not have the time, energy, or interest in attending a meeting in the evening. Further, it was pointed out that "a meeting at the library won't work….you have to give fishermen some reason to attend, like a barbecue." This fact was clearly demonstrated in Tinian where a barbecue was held and attendance was considerable. Another comment was that the only time to get fishermen to come to a meeting would be on the one day when they don't go fishing, which is reportedly on Sunday. However, several other fishermen commented that they wouldn't go to a meeting on Sunday because it is their only real day off to spend with their families.

The most likely cause of non-participation is that fishermen see little or no personal benefit in attending a focus group meeting. The meetings take time from their evenings and if they have spent a day on the water they are not likely to want to attend a meeting that evening. In addition, during intercept interviews, fishermen expressed considerable distrust of government and government institutions. Even though the principal investigator was associated with the local college some fishermen may still associate the study with government and that may play a role in their unwillingness to participate in meetings.

In light of these experiences, formal focus group creation on Saipan has not been effective. Input from fishermen has had to come from individual interviews at dockside and impromptu discussions with groups of fisherman. Despite this fact, a significant amount of input was gathered during such discussions and the dockside discussions have served well for this purpose. In point of fact, individual interviews may be the most appropriate method of soliciting stakeholder input because of the presence of a consistent and repeated group dynamic that developed in group meetings at dockside in all three of the study islands. That dynamic consisted of an unwillingness to speak unless several other participants were present, followed by generally non-provocative discussions of fairly obvious concerns. After such general discussions had reverted to common themes, a prominent member of the group would usually state their concerns rather directly and other individuals would reiterate that position in turn. Exchanges of this type usually brought constructive discussion to closure.

It is important to note that most fishermen were willing to participate in the intercept interview and many were quite willing to carry the discussion beyond the interview into a focus meeting at dockside. So it seems that willingness to participate has a lot to do with how easy participation is made for fishermen. Another consideration is that fishermen seemed much more at ease during intercept interviews if there were no other fishermen present. Thus, it seems that participation in a formal meeting with a large number of participants is not a fisherman's preferred way to provide input.

If fisheries management in the Commonwealth is to attempt to incorporate a participatory approach, it must first develop some method for getting fishermen to participate. One such method would be to promote the creation of a commercial fishing association. This association should be distinctly separate from the existing sportfishing association in order to represent interests of commercial fishermen. The association could elect a board of directors who could serve as advisors to the CNMI Government and Western Pacific Regional Fisheries Management Council. The directors would serve as representatives of the association membership and could provide comment on management measures, legislation, and policies that affect commercial fishing in the Commonwealth. It would be important to include representatives from Tinian, Rota, Saipan, and the Northern Islands.

Another proactive step that could be taken by local and/or federal fisheries agencies would be the formation of a local commercial fishing advisory board. Membership on this board could include representatives of the pelagic, reef, and bottomfishing groups as well as charter operators. Such an advisory board would serve the purposes of providing stakeholder input to fisheries managers, providing a conduit for educating fishermen on management issues, and could serve the function of educating fishermen of their status as stakeholders. Involving an advisory board in the fisheries management process could improve the level of trust that fishermen have in government.

4.2. CAPACITY DATABASE

A goal of this study was to create a domestic pelagic fishery capacity database. The idea behind this was to attempt to identify those vessels in the CNMI that are potential pelagic commercial fishing vessels and to assess their productive capacity. This analysis was also intended to help define the intercept interview potential population in order to gain some understanding of dimensions of the survey frame.

4.2.1. Accomplishments and Findings

The starting point for this analysis was the CNMI Boating Safety vessel registration records. All vessels are required to register with the Boating Safety Office and obtain a CNMI registration number. Vessels that are engaged in the transport of commercial passengers for hire are required to obtain a commercial passenger or CP registration. The actual registration is recorded as a sequenced number (in the 2000 range currently) followed by an alphanumeric designator of its intended use. For example, a CP vessel would be registered as 9876 CP. Vessels that are intended for commercial fishing are supposed to obtain a CF registration. However, since there are no specific requirements for commercial fishing vessel licenses, many commercial vessels intercepted in the course of the study were registered as personal use vessels with a PU registry. Unfortunately, the Boating Safety Office database does not appear to be regularly updated and a review of the records indicated that there were a number of vessels that apparently have not renewed their registration.

Floyd Masga of the CNMI Division of Fish and Wildlife (CNMI-DFW) provided an amended version of these records that the Division uses in its Western Pacific Fisheries Information Network (WESTPACFIN) data collection program funded by the National Marine Fisheries Service. The Division of Fish and Wildlife has spent considerable time and effort on purging the database of duplicate and inactive records. Their database includes 874 registration records, which included 147 CP vessels, 89 CF vessels and 582 PU vessels for Saipan. However, a sort of the data by registration date and elimination of any vessel not registered in 1999 reveals that only 170 of the 582 PU vessels and 24 of the 89 CF vessels appear to have current registrations. Thus,

it was necessary to determine actual usage of these vessels to determine whether they could all be considered as potential pelagic commercial fishing vessels.

In early October of 1999, a canvassing of Saipan boat launches and marinas was undertaken to determine how vessels of each registry category were actually being used. During the canvassing, approximately 30 CP registered vessels were observed. Most of these vessels were parasail and/or banana boat vessels or passenger transport vessels. Discussions with CP registered vessel operators made it clear that they do not participate in charter or commercial fishing. Their operations are limited to the lagoon area and their trips are of short duration to maximize daily revenue. Most of these vessels are equipped to carry passengers and they are not outfitted with fishing gear. If fact, all of the CP registered vessels observed were strictly involved in commercial passenger related businesses. Thus, it is safe to assume that CP registered vessels are not potential pelagic commercial fishing vessels and can be eliminated from the survey frame.

Embedded in CF and CP registrations are 53 vessels with a use category of charter fishing vessel. While arguably commercial in nature, the motivations, investment, and operating methods of charter fishing vessels are completely different from commercial fishing vessels. Thus, this category of vessels must be eliminated from the survey population. Elimination of these vessels leaves the CF and PU registered vessels as potential pelagic commercial fishing vessels.

Unfortunately, it is not possible to determine the status of the vessels that are not currently registered but are included in the database. Some of these vessels may be destroyed or dilapidated beyond repair. Others may have changed hands and been re-registered. Others may no longer be in the Commonwealth. For these reasons, the vessels not currently registered cannot be assumed to be part of the survey frame. Some may indeed be potential commercial pelagic vessels but the existing data do not make it possible to make such a determination.

The conclusion of the review of the vessel registration database is that the potential survey frame for this study consists of currently registered vessels of the CF and PU registry categories with charter fishing vessels eliminated. That frame is 194 vessels of which 24 are commercial fishing registry and 170 fall into the more general personal use category.

While it was expected that the vessel registration database would lack information on vessel capacity for commercial fishing what was not expected was that the database would lack contact information such as addresses and phone numbers. None of the current commercial fishing registered vessels and only 14 of the personal use registered vessels had complete addresses. The addresses that are in the database are only post office boxes. Thus, it is not possible to use the addresses that exist to locate vessels. Further only 1 of the current commercial fishing registered vessels and 14 of the current personal use registered vessels had phone numbers. Thus, the information available from the vessel registration database is insufficient in its contact information to allow development of the capacity database. The only method that could be used would be to attempt to locate telephone numbers for the listed vessel owner or to simply drive around and try to locate these vessels and locate their owners. Given the amount of resources that would be necessary to attempt either method it was instead decided to utilize the intercept interview to gather vessel capacity information. Questions were added to the interview format for this purpose and are discussed in section 4.2. What can be determined from the vessel database is that there are 194 vessels that can be considered as potentially active in the pelagic commercial fishery of the CNMI. Thus, the survey population appears to be 194 vessels. However, it is not possible to know how many of these vessels are actually operating because there is no requirement in the CNMI for commercial fishing vessel, operator, or crew licenses.

4.2.2. Problems Encountered

The fundamental problem encountered in conducting the capacity database research was that the database is nearly void of vessel owner contact information. Many vessels listed in the database appear to be no longer registered but no clear indication is given as to such vessels are still in existence, were transferred to another owner and re-registered, or destroyed. In addition, there appear to be duplicate registries. The problems with this database prevented it from being a useful input into establishing a comprehensive database of commercial fishing vessel capacity in the CNMI.

4.2.3. Conclusions and Recommendations

The vessel registration database needs to be seriously improved. Duplicate records need to be culled from the system. Contact information should be gathered for each vessel owner. Registration numbers that have not been used in many years should either be re-cycled or put into a database of inactive vessels so that an active vessel database can be created.

4.3. COST AND EARNINGS

The principal tool used to analyze costs and earnings was the vessel intercept interview. Table 4.2 displays the number of intercepts by month with a breakdown of commercial versus recreational vessel intercepts. There were also a total of 15 refusals to participate in the intercept interviews.

Table 4.2: Vessel Intercepts by Month.

Month	Commercial observations	% of commercial observations	Recreational observations	% of recreational observations	Total	% of Total observations
Nov. 1999	4	13	2	20	6	15
Dec. 1999	3	10	1	10	4	10
Jan. 2000	6	20	2	20	8	20
Feb. 2000	2	7	0	0	2	5
Mar. 2000	2	7	0	0	2	5
April 2000	3	10	1	10	4	10
May 2000	1	3	1	10	2	5
June 2000	5	17	3	30	8	20
July 2000	0	0	0	0	0	0
Aug. 2000	4	13	0	0	4	10
Refusals					15	
Totals	**30**	**100**	**10**	**100**	**55**	**100**

Source: Intercept Interview Data

4.3.1. Accomplishments and Findings

As reported above, there were 40 successful intercept interviews and 15 refusals. Twenty (20) of the successful intercepts occurred on Saipan, seven on Tinian, and three on Rota. Each vessel intercepted was interviewed only once (sampling without replacement). Because of the small number of respondents on Rota and Tinian, it is not possible to group the respondents into full-time, part-time, and recreational categories without compromising the confidentiality of the Rota and Tinian participants. For this reason, an attempt was made to merge Rota and Tinian vessel data with Saipan data. The merging of the data for Saipan and Tinian was largely successful as the two islands are quite close together and exhibited similar cost and return structures. However,

Rota exhibited much higher operating costs and much more limited markets than. In addition, Rota had so few respondents and so few operating vessels that reporting any of the Rota data in the dataset could compromise the confidentiality of Rota respondents. Regrettably, Rota data was not included in the analysis nor in the data set in order to protect the confidentiality of Rota fishermen. However, focus interview input from Rota fishermen has been included previously in this report.

Intercept interview observations were categorized into subgroups. The subgroups used in this study were constructed by first grouping observations by whether the respondent self-categorized his fishing operation as fulltime commercial, part-time commercial, or recreational/subsistence. An additional review of recreational and/or subsistence vessels determined that two of those vessels intended to sell fish. Thus, these vessels were included in the commercial dataset.

A further division of observations is made for the full- and part-time commercial groups by removing vessels that exclusively targeted reef and/or bottomfish. The result is four subgroups of the data: pelagic full-time commercial, pelagic part-time commercial, reef/bottomfish commercial, and recreational/ subsistence. Table 4.3 provides a summary of the number of observations in each subgroup of the data.

Table 4.3: Observations and Trips by Subgroup

Subgroup	Observations	Commercial Trips
Pelagic full-time commercial	13	25
Pelagic part-time commercial	14	27
Reef/bottomfish commercial	3	8
Recreational/Subsistence	10	0
Refusals	15	0
Total	55	60

Source: Intercept Interview Data

Each interview collected trip-specific data on the respondent's two most recent trips. Data from each trip was merged with the vessel and respondent-specific data to create a trip-specific data set containing 60 trip level observations. However, several of the trips specifically targeted bottomfish or reef fish. Since the focus of this analysis is on pelagic trips, bottomfish and reef fish trips were removed from the pelagic trips dataset and were instead included in a reef/bottomfish vessel per trip dataset, which is not being analyzed here. The result of this segregation was the removal of one trip from the full-time commercial vessel trips and one trip from the part-time commercial vessel trips. Thus, there are 25 full-time commercial vessel pelagic trips and 27 part-time commercial vessel pelagic trips included in this analysis.

4.3.1.1. Pelagic Fishing Vessel Equipment and Investment Characteristics

Analysis of the survey data has been conducted to compile descriptive statistics of vessel and operator characteristics. As shown in the table 4.4, the average and media age of participants is near 40 years in both the full and part-time. The minimum age for vessel operators for both the full and part-time subgroups is 30 years. Education levels are equivalent to a high school education for full-time fishermen and some college education for part-time fishermen. Table 4.4 also shows that the 23 year average experience level of full-time fishermen is slightly less than the average of 25.5 years for part-time fishermen.

Survey respondents were asked whether they owned the vessel they were operating and whether others operated the vessel without them. Sixty-two percent of the full-time vessel operators indicated that they owned the vessel, while ninety-two percent of the part-time operators own the vessel they were operating. In addition, forty-six percent of the full-time operators reported that others use the vessel without them but only twenty-five percent of the part-time operators allow others to use the vessel without them on board.

Table 4.4: Vessel Operator Characteristics (years)

Subgroup	Statistic	Age	Education	Experience
Full-time	**average**	40.00	11.69	23.00
	stddev	9.35	1.11	10.54
	median	40.00	12.00	25.00
	max	60.00	14.00	38.00
	min	30.00	10.00	5.00
Part-time	**average**	39.93	12.57	25.50
	stddev	10.38	1.22	13.04
	median	40.00	12.00	20.00
	max	64.00	14.00	49.00
	min	30.00	10.00	8.00

Source: Intercept Interview Data

Table 4.5: Ownership and Use of Vessels (%)

Subgroup	Ownership	Use by others
Full-time	62	46
Part-time	92	25

Source: Intercept Interview Data

Table 4.6 shows vessel size, power, fuel, and water capacity statistics. The average size of vessels used by full-time fishermen rounds to 19 feet as compared to 17 feet for part-time fishermen. Full-time vessel size ranged from 16 to 22 feet, while part time vessels ranged from 14 to 23 feet. The median for both subgroups was 17 feet. Vessel width was also slightly larger for full-time commercial boats than for part-time. Though these are simple averages, these statistics suggest that full-time commercial fishing operations utilize larger vessels than part-time operations.

Table 4.6: Vessel Characteristics; Size, Power, Fuel, and Water.

Subgroup	Statistic	Length (feet)	Width (feet)	HP	Fuel (gal)	Water (gal)
Full-time	**average**	18.69	6.08	110.38	50.15	1.62
	stddev	2.50	0.86	39.08	22.63	0.51
	median	17.00	6.00	110.00	48.00	2.00
	max	22.00	8.00	230.00	110.00	2.00
	min	16.00	5.00	70.00	24.00	1.00
Part-time	**average**	17.14	5.21	98.29	34.21	2.07
	stddev	2.57	0.58	63.37	19.20	1.38
	median	17.00	5.00	88.00	36.00	2.00
	max	23.00	6.00	200.00	72.00	5.00
	min	14.00	4.00	10.00	5.00	1.00

Source: Intercept Interview Data

Average Engine horsepower is also slightly larger for full-time boats than for part-time boats. On average, full-time vessels are equipped with 110 horsepower, while part-time vessels averaged near 98 horsepower. Note, however, that there are large standard deviations associated with these averages and the ranges of horsepower used by each group are quite large. These statistics are indicative of the high degree of variability in vessel horsepower utilized by fishermen in both groups. Fuel capacity of vessels mimics the findings for vessel length and horsepower. Full-time vessels averaged just over 50 gallons of fuel capacity, while part-time vessels averaged just over 34 gallons

Intercept interview questions on water holding capacity were included in this study to determine whether the vessels currently operating were capable of extended trips that would require water. Part-time vessels averaged just over 2 gallons of water, while full-time boats carried 1.62 gallons on average. The point of these statistics is to illuminate the limited capability for extended trips of the vessels currently used in the pelagic fishery. Data were also collected on facilities for sleeping, cooking, and human waste handling. However, none of the vessels intercepted reported having any of these facilities. Thus, it is safe to conclude that the vessels currently operating in the pelagic fishery are not capable of trips much longer than a single day.

Full-time vessels averaged a purchase year of 1992, while part-time vessels averaged a more recent purchase year of 1994. Median purchase years were 1991 for full-time and 1995 for part-time vessels. This result shows that half of the part-time vessels currently operating in the fishery were purchased relatively recently. This might suggest that some of the part-time participants in the fishery are relatively new entrants to the fishery. However, data on tenure in the fishery was not collected. Thus, no conclusion can be drawn other than that part-time boats tend to be newer and more recently acquired than full-time boats currently operating in the fishery.

Average value of investment in boat and trailer is more than $5,000 greater for full-time vs. part-time boats. The median investment value is a little less than $3,000 more for full-time vs. part-time boats. The maximum value of investment was $41,000 in the full-time subgroup and only $23,700 in the part-time subgroup. Thus, it seems that full-time vessel operators invest considerably more in their vessels than part-time operators.

Table 4.7: Age, Length of Ownership, and Investment in Vessels

Subgroup	Statistic	Year Bought	Boat/trailer cost	Year built
Full-time	**average**	1992	17,033.33	1988
	stddev	5.07	8,865.90	4.69
	median	1991	16,250.00	1989
	max	1998	41,000.00	1998
	min	1985	8,500.00	1981
Part-time	**average**	1994	12,364.29	1989
	stddev	4.92	6,925.05	5.85
	median	1995	13,350.00	1990
	max	1999	23,700.00	1997
	min	1986	3,600.00	1975

Source: Intercept Interview Data

Table 4.8 provides statistics on radio and electronics equipment carried by vessels in the pelagic fishery and the percent of positive observations for each kind of equipment. The average cost of CB radios is $125 for full-time, and $259 for part time vessels. Only fifteen percent of full-time and fourteen percent of part-time vessels were equipped with CB radios. In contrast, ninety-two

percent of full-time, and ninety-three percent of part-time vessels are equipped with VHF radios. The average cost of VHF radios was approximately $413 and $261 for full and part-time vessels respectively. None of the vessels intercepted were equipped with SSB/HF radios. All but one of the vessels in the intercepted sample was equipped with some kind of radio and some vessels had more than one radio on board. Data on electronics show that only fifteen percent of the full-time vessels are equipped with depth sounders and only eight percent have fish finders. Somewhat surprisingly, only 31 percent of full-time vessels reported being equipped with GPS. Only twenty one percent of Part-time vessels reported having GPS and the same percent reported having fish finders. None of the part-time vessels reported having depth sounders.

Table 4.8: Radio Equipment and Electronics Investment Characteristics ($ & %)

Subgroup	Statistic	Cb cost	Vhf cost	Depth Sounder	Fish Finder	GPS
Full-time	**percent**	15	92	15	08	31
	average	125.00	412.73	500.00	350.00	366.67
	stddev	35.36	247.15	424.26		375.28
	median	125.00	400.00	500.00		150.00
	max	150.00	1000.00	800.00		800.00
	min	100.00	100.00	200.00		150.00
Part-time	**percent**	14	93	0	21	21
	average	259.00	260.77		1,600.00	196.67
	stddev	154.15	68.98		721.11	75.72
	median	259.00	300.00		1,800.00	230.00
	max	368.00	400.00		2,200.00	250.00
	min	150.00	150.00		800.00	110.00

Source: Intercept Interview Data

Investment in electronics by subgroup shows very wide ranges and the average statistics are somewhat questionable given the low percentages of vessels equipped with these items. Note that in table 4.8 and in all tables of vessel characteristics the averages reported are averages of only those vessels that reported being equipped with the item. Inclusion of zero entries for vessels not equipped with the items would skew actual investment, when it occurs, towards zero. Note also that when there are no vessels equipped with the item the percent is zero and no other statistics are reported and if only one vessel reports having the item the average is actually the single observation value and no other statistics are reported.

Despite the age of many of the vessels active in the fishery only fifteen percent of full-time vessels and twenty-one percent of part-time vessels reported making major upgrades. However, the amount spent on vessel upgrades, when they occurred, was considerably larger on average for the full-time vessels than for the part-time vessels. This may be due to the fact that full-time vessels tend to be older than part-time vessels as was shown in table 4.6, and that they get considerably more use. Table 4.9 also shows statistics on reported other expenses that could not be classified in the detailed expenditure categories of the intercept interview and included such items as gaffs, bimini tops, and rod holders.

All vessels, both full and part-time, were equipped with life jackets and flares. All full-time vessels had fire extinguishers aboard and ninety-three percent of part-time vessels had fire extinguishers aboard. However, none of the part-time vessels and only one of the full-time vessels reported being equipped with an Emergency Position Identification Radio Beacon (EPIRB). Statistics on expenditures for safety items are also shown in table 4.10. In each category, full-time vessels averaged larger expenditures than part-time vessels.

Table 4.9: Upgrades and Other Vessel Costs (% & $)

Subgroup	Statistic	Upgrade cost	Other cost
Full-time	**percent**	15	23
	average	9,000.00	233.33
	stddev	9,899.49	230.94
	median	9,000.00	100.00
	max	16,000.00	500.00
	min	2,000.00	100.00
Part-time	**percent**	21	07
	average	3,500.00	120.00
	stddev	3,905.12	
	median	1,500.00	120.00
	max	8,000.00	120.00
	min	1,000.00	120.00

Source: Intercept Interview Data

Table 4.10: Safety Equipment (% & $)

Subgroup	Statistic	Life jackets	Flares	Fire ext.	EPIRB
Full-time	**percent**	100	100	100	4
	average	223.08	80.00	40.38	1,200.00
	stddev	86.35	17.20	20.56	
	median	250.00	80.00	40.00	
	max	400.00	120.00	100.00	
	min	80.00	50.00	15.00	
Part-time	**percent**	100	100	93	0
	average	178.21	64.29	33.85	
	stddev	122.91	31.00	22.81	
	median	130.00	50.00	25.00	
	max	400.00	160.00	100.00	
	min	30.00	40.00	12.00	

Source: Intercept Interview Data

Table 4.11 presents statistics on fishing rod and reel equipment on board vessels as well as expenditures on those items. Note that the table indicates the percent of vessels that had the type of equipment on board. The average, standard deviation, median and range statistics for each type of equipment relate to the number of each item on board vessels. The cost statistics are cumulative, meaning that they are not per item but inclusive of all of the items on board the vessel.

All full-time vessels were equipped with at least one rod and manual reel and fifty-four percent of full-time vessels have at least one electric reel aboard. Part-time vessels were not always equipped with fishing rods and reels as many utilize handlines instead of rod and reel or in addition to rod and reel equipment. Eighty-six percent of part-time vessels reported having at least one rod aboard and seventy nine percent reported using manual reels. Only twenty-one percent of part-time vessels reported having at least one electric reel aboard.

Full-time vessels reported having an average of approximately two rods on board, which was also the median number of rods. The largest number of rods carried by any full-time vessel was four.

Similarly, full-time vessels reported using an average of nearly two manual reels. The fifty-four percent of full-time vessels equipped with electric reels reported an average of 1.57 electric reels on board. Given that reels are discrete units and only one or two reels were reported, the median of two is more illuminating in that it indicates that half of the full-time boats that use electric reels had two electric reels and half had one electric reel.

Data for part-time vessels shows that they tended to have fewer rods and reels aboard on average. The median number of fishing rods on board part-time vessels was 1.5 meaning that fifty percent of the part-time vessels that use fishing rods carry two or more rods and fifty percent that use rods carry only one rod. The median number of manual reels on part-time boats was two and the average number aboard was near two, which in comparison to statistics for rods seems to indicate the use of manual reels without rods. This was observed to be true in that some vessels use a manual reel mounted to a pipe and attach a rubber tubing snubber to the line to dissipate the shock of fish strikes.

Table 4.11: Fishing Rods and Reels (% num. & $)

Subgroup	Statistic	Fishing Rods	Rods Cost	Manual Reels	Manual Reel Cost	Electric Reels	Electric Reels Cost
Full-time	**percent**	100		100		54	
	average	2.23	1,119.23	2.08	965.38	1.57	2,100.00
	stddev	1.01	756.51	0.95	524.16	0.53	812.40
	median	2.00	1,000.00	2.00	900.00	2.00	2,200.00
	max	4.00	3,000.00	4.00	2,000.00	2.00	3,000.00
	min	1.00	250.00	1.00	250.00	1.00	900.00
Part-time	**percent**	86		79		21	
	average	1.75	816.67	1.82	652.18	1.33	1,533.33
	stddev	0.87	715.52	0.75	526.45	0.58	57.74
	median	1.50	500.00	2.00	500.00	1.00	1,500.00
	max	3.00	2,500.00	3.00	1,800.00	2.00	1,600.00
	min	1.00	200.00	1.00	174.00	1.00	1,500.00

Source: Intercept Interview Data

Statistics on expenditures for fishing rods and reels are also shown in table 4.11. On average, full-time vessels are quipped with $1,119.23 worth of fishing rods and $968.38 worth of manual reels. Full-time vessels equipped with electric reels reported average expenditures of $2,100.

Rod and reel expenditure statistics for part-time vessels show smaller average expenditures than full-time vessels. Part-time vessels that use fishing rods have an average of $816.67 worth of rods on board and spent an average of $652.18 on manual fishing reels. An average of $1533.33 was spent on electronic reels by the twenty-one percent of the part-time boats that have electric reels.

Data were also gathered on the use of lures and hand lines. Eighty-five percent of full-time and eighty-six percent of part-time boats used handlines. Full-time vessels average three handlines on board, while part-time vessels averaged two. The median of three for hand lines in the full-time subgroup indicates that half the vessels use more than three hand lines and half use fewer than three. Part-time vessels used slightly fewer handlines on average. Half the part-time boats that do use handlines use two or more but not more than four as evidenced by the median and range

statistics. Total expenditures for lures and handlines show similar average expenditures for both the full-time and part-time vessels.

Table 4.12: Lure and Hand lines (%, num, & $)

Subgroup	Statistic	Lures (num)	Lure Cost (total $)	Hand Lines (num)	Hand Lines Cost (total $)
Full-time	**percent**	100		85	
	average	29.09	623.08	2.82	395.45
	stddev	25.87	493.55	1.08	328.98
	median	20.00	500.00	3.00	300.00
	max	100.00	2,000.00	4.00	1,000.00
	min	10.00	100.00	1.00	100.00
Part-time	**percent**	100		86	
	average	25.00	607.14	2.42	383.33
	stddev	25.33	760.28	1.08	405.27
	median	20.00	350.00	2.00	200.00
	max	100.00	3,000.00	4.00	1,500.00
	min	5.00	50.00	1.00	50.00

Source: Intercept Interview Data

An item of interest for this study is the holding and chilling capacity of commercial vessels operating in the pelagic fishery of the CNMI. As expected, all vessels reported carrying coolers on board or having built in fish boxes. Full-time vessels averaged just under two coolers and had a median of two coolers. Part-time vessels averaged just over one cooler on board with a median of one. Thus, full-time vessels tended to have greater holding capacity on board than part-time vessels. It was observed during the interview process that these coolers, if not built in, were usually 110-quart coolers.

Expenditures on coolers and fish boxes show that full-time commercial vessels averaged more than twice the expenditure on coolers and fish boxes than part-time vessels. Once again, standard deviations indicate wide variability and the range of expenditures was quite large for full-time vessels. It is important to note that none of the coolers and/or fishboxes was equipped with any kind of refrigeration. Vessels rely on bag ice to chill fish.

Table 4.13: Coolers/Fish Boxes (%, num, & $)

Subgroup	Statistic	Coolers (num)	Cooler cost ($)
Full-time	**percent**	100	
	average	1.85	453.85
	stddev	0.80	489.43
	median	2.00	300.00
	max	4.00	2,000.00
	min	1.00	40.00
Part-time	**percent**	100	
	average	1.21	201.43
	stddev	0.58	163.70
	median	1.00	150.00
	max	3.00	700.00
	min	1.00	50.00

Source: Intercept Interview Data

Expenditures under each of the categories discussed so far can be summed to calculate an overall investment value for each vessel. This value includes investment in boat and trailer, radios electronics, safety equipment, gear, upgrades, and any other costs the respondent identified. Table 4.14 provides statistics on total investment in vessel and equipment. The average investment totals are $22,881.92 and $16,739.07 for full and part-time vessels respectively. Median statistics show that half of the full-time vessels have total investments greater than $21,470. The part-time vessel total investment median of $15,849 is somewhat closer to the average for part-time vessels.

Table 4.14: Total Investment in Vessel and Equipment ($)

Subgroup	Statistic	Total investment
Full-time	**average**	22,881.92
	stddev	15,492.28
	median	21,470.00
	max	68,210.00
	min	2,280.00
Part-time	**average**	16,739.07
	stddev	8,919.21
	median	15,849.00
	max	33,420.00
	min	4,180.00

Source: Intercept Interview Data

4.3.1.2. Vessel Trip Characteristics

The intercept interview gathered data on trip lengths and the timing of trips. These data were gathered to determine whether the pelagic fleet takes multi-day trips and to identify any patterns in the times that pelagic boats return to port. As shown in table 4.15 the average trip departure times are around 9:00am and 9:30am for full-time and part-time vessels respectively. The median departure time for full-time vessels is also 9:00am but it is an hour later, or 10:00am, for part-time vessels. The median return time for full-time vessels is 4:30pm as compared to the median for part-time vessels of 3:30pm. Average return times also show that full-time vessel trips end just over a half-hour later than part-time vessel trips. The maximum statistics indicate that vessel trips ended no later than 6:00pm for both subgroups.

The average trip length for full-time vessels is just over seven hours, which is a little more than an hour greater than the five hours and fifty-two minute average trip length of part-time vessels. The longest trip for full-time vessels was ten hours and the shortest was four hours. The median shows that half of the trips taken by full-time vessels were between seven and ten hours long and half were between four and seven hours long. The median for part-time vessel trip length indicates that half of the trips were between six and nine and a half hours long while the other half were between one hour and six hours in length. The data indicate that full-time vessels take trips more often. However, full-time and part-time fishermen tend to spend almost the same amount of time fishing when they go out.

Full-time vessels averaged a longest trip that was two hours longer than part-time vessels. Note, however, that the median statistics and minimums are the same at ten and eight hours respectively. The maximum in the full-time group is 30 hours as compared to 12.5 hour for the

part-time subgroup. This suggests that the average for the longest trip taken in the full-time subgroup may be skewed upwards by the single 30 hour longest trip observation.

Full-time vessels average nearly 23 trips per month, while part-time vessels averaged just under 10. Full-time vessels reported no fewer than 20 trips per month and some reported as many as 30. The least number of trips by part-time vessels was two and the most was 20. Half of the full-time vessels took more than 24 trips and half took fewer than 24 trips, but not less than 20. In sharp contrast, the median for part-time vessels was only 9 trips per month.

Table 4.15: Trip Timing (time, hours, & num.)

Subgroup	Statistic	Trip Depart Time	Trip Return Time	Trip Length	Longest Trip	Trips per month
Full-time	**average**	8:57	16:03	7:05	11.73	22.77
	stddev	1:36	1:11	1:28	5.71	3.09
	median	9:00	16:30	7:00	10.00	24.00
	max	12:00	18:00	10:00	30.00	30.00
	min	6:00	13:00	4:00	8.00	20.00
Estimated Annual Total Full-time Trips					**3552**	
Part-time	**average**	9:32	15:24	5:52	10.04	9.93
	stddev	2:03	1:25	2:07	1.42	5.51
	median	10:00	15:30	6:00	10.00	9.00
	max	13:00	18:00	9:30	12.50	20.00
	min	6:00	12:00	1:00	8.00	2.00
Estimated Annual Total Part-time Trips					**1668**	
Estimated Annual Total Trips					**5220**	

Source: Intercept Interview Data

Prior publications on pelagic fisheries of the CNMI have indicated that the fishery is primarily composed of small vessels that take day trips of 20 miles or less from shore (CNMI-DFW, 1995). To verify this, the intercept interview collected trip data on distance from port and distance from land. The number of fishermen on board was also collected.

Table 4.16: Trip Distances, and Fishermen On Board.

Subgroup	Statistic	Distance from Port (miles)	Distance from Land (miles)	Total Number on Board
Full-time	**average**	19.52	14.68	2.20
	stddev	7.38	10.21	0.87
	median	20.00	15.00	2.00
	max	35.00	35.00	3.00
	min	10.00	2.00	1.00
Part-time	**average**	17.11	14.33	2.33
	stddev	12.90	12.99	0.68
	median	15.00	10.00	2.00
	max	50.00	50.00	4.00
	min	4.00	1.00	2.00

Source: Intercept Interview Data

Trips taken by full-time vessels averaged nearly 20 miles distance from port but slightly less than 15 miles from land. Trips taken by part-time vessels averaged similar distance from land but slightly less average distance from port. The maximum distance from land and port on trips taken by full-time vessels was 35 miles. The median distance from land was 15 miles. This means that half of the trips taken by full-time vessels were between 15 and 35 miles from land and half were less than 15 miles from land. Trips taken by part-time vessels had a maximum distance of 50 miles. However, the median distance from port was 15 miles and the median distance from land was 10 miles. Thus, half of the trips taken by part-time vessels were between 10 and 50 miles from shore and half were less than ten miles from shore.

Given the discrete nature of the data on the number of fishermen on board the vessel, the averages and medians can be interpreted as two fishermen for both subgroups. The full-time vessels intercepted carried not more than three people and in some cases only a single fisherman. Part-time vessels intercepted carried as many as four fishermen and not fewer than two.

There is continual debate among government regulatory agencies and fishermen regarding the definition of commercial fishing. The U.S. Coast Guard considers any vessel that sells one fish per year to be a commercial fishing vessel and subject to all rules and regulations that apply to commercial fishing vessels. The intercept interview elicited fishermen opinion on this topic by asking fishermen to indicate whether they consider certain categories of selling behavior fit their definition of commercial fishing. The categories were; sells one fish, sells to cover expenses, sells to make a profit, sells to friends and neighbors, sells to stores and restaurants, earns a majority of income from fishing, and relies solely on fishing income.

None of the commercial pelagic vessel operators felt that selling one fish per year meant that they were commercial fishing. Only twenty-three percent of full-time and seven percent of part-time operators responded that selling to cover trip expenses constitutes commercial fishing. There was much more agreement that selling for profit, to stores and restaurants, to earn a majority of income and if fishing was the only income source all constituted commercial fishing. However, some fishermen did not think selling to stores and restaurants constitutes commercial fishing. Some part-time fishermen even felt that selling for a profit is not commercial fishing. Perhaps most interesting is that only fifteen percent of full-time and sixty-four percent of part-time operators felt that selling to friends and neighbors constitutes commercial fishing.

Table 4.17: Commercial Fishing Definitions (percent of responses)

Subgroup	One fish	Expenses	Profit	Friends/ neighbors	Stores/ restaurants	Majority of income	Only income
Full-time	0	23	100	15	92	100	92
Part-time	0	07	93	64	93	100	100

Source: Intercept Interview Data

Of interest to this study was to determine whether fishermen utilize different fishing methods, and therefore target different fish when they fish recreationally versus when they fish commercially. To gather data on such behavior the intercept interview included a question on what method/target fishermen utilized on trips when they did as well as when they did not sell any fish.

Forty-six percent of the full-time and seventy-nine percent of part-time fishermen indicated that they take trips when they do not sell any fish. Full time fishermen trolled on eighty percent, and bottomfished on twenty-one percent of those non-sale trips. Full time fishermen did not report any mixed or reef fishing activity. Part-time fishermen trolled on seventy-two percent,

bottomfished on seventeen percent, reef fished on nine percent, and used a mixed troll/bottomfish method on two percent of their non-sale trips.

Full-time pelagic vessels reported that they troll on ninety-three percent of their commercial trips. Only six percent of the trips are for bottomfishing, less than one percent were mixed, and none were reef fishing trips. Part-time operators reported much more diversity of fishing method on commercial trips. Three-quarters of part-time commercial trips were trolling trips. Bottomfishing and the mixed method accounted for twelve percent each. Part-time vessels reported that just over one percent of their commercial trips on average were for reef fishing.

Table 4.18: Fishing Methods on Non-Sale and Commercial Sale Trips

Trip Type	troll	bottomfish	Mixed troll/ bottomfish	Reef fish
Non-sale Full-time	79	21	0	0
Non-sale Part-time	72	17	2	9
Commercial Full-time	93	6	1	0
Commercial Part-time	75	12	12	1

Source: Intercept Interview Data

4.3.1.3. Variable Trip Costs

It is important to note that the percent statistics indicate the percentages of trips where a positive observation of cost for each item was reported. The averages are calculated using the positive observations to provide a more accurate depiction of the average cost for an item that is used on a relatively small number of trips than if a large number of zero entries were included.

Table 4.19 shows that ice, fuel, and oil were used on all trips. However, bait was used on twenty and fifteen percent of the full and part-time vessel trips respectively. None of the full-time vessel operators and only twelve percent of part-time operators reported expenditures on. Eighty-four percent of full-time vessel trips required expenditures for new fishing gear, while such expenditures was made for only forty-four percent of part-time vessel trips.

Table 4.19: Variable Costs Per Trip (% and $)

Subgroup	Statistic	Ice	Bait	Gear	Fuel	Oil	Food	Total
Full-time	**percent**	100	20	84	100	100	0	
	average	12.50	1.36	13.04	62.96	8.84	0.00	98.70
	stddev	5.80	2.98	11.13	25.82	5.37	0.00	33.88
	median	10.00	0.00	15.00	60.00	8.00	0.00	95.00
	max	30.00	10.00	50.00	150.00	20.00	0.00	200.00
	min	6.00	0.00	0.00	20.00	2.00	0.00	48.00
	percent of total	12.6	1.4	13.2	63.8	9	0	
Part-time	**percent**	100	15	44	100	100	12	
	average	8.06	1.11	4.81	41.63	6.22	3.52	65.35
	stddev	4.62	2.89	6.72	24.31	4.11	6.91	34.35
	median	7.50	0.00	0.00	36.00	5.00	0.00	75.00
	max	15.00	10.00	25.00	90.00	17.00	20.00	137.00
	min	2.50	0.00	0.00	10.00	2.00	0.00	17.00
	percent of total	12.3	1.7	7.4	63.7	9.5	5.4	

Source: Intercept Interview Data

Average expenditures on variable inputs differ considerably between subgroups. The average expenditure on variable inputs was larger on trips taken by full-time operators in all categories except food. In total, trips taken by full-time operators averaged nearly $100 in variable costs as compared to about $65 in variable cost per trip for part-time operators.

Fuel is the single largest variable cost component and accounts for nearly sixty-four percent of total variable cost per trip for both subgroups. Gear is the next largest component for the full-time group followed by ice. In contrast, part-time vessel operators did not report spending as much on gear, however, they spent nearly the same percentage as full-time operators on ice. Both subgroups spent around nine percent of their trip costs on oil.

Both subgroups spent less then one percent on bait, which is not unexpected given that the surface troll fishery tends to utilize reusable artificial lures. This analysis indicates that full-time fishermen tend to have larger variable costs per trip than part-time fishermen, which is in contrast to fixed costs which tend to be larger for part-time fisherman than full-time fishermen as shown in the next section.

It is interesting to compare the cost per trip of the CNMI pelagic fleet with those of the Hawaii small boat fleet. Results of an analysis of the Hawaii Small boat fleet included estimation of per trip expenditures by both full and part-time vessels targeting pelagic species (Hamilton and Huffman, 1997). What is immediately apparent is that total expenditures by both full and part-time pelagic vessels operating in Hawaii in 1995-96 were considerably higher than current expenditures of the CNMI fleet. Hawaii vessels reported expenditures on truck fuel, food, and bait that CNMI fishermen did not report making.

Table 4.20: Hawaii Pelagic Small Boat Costs Per Trip (mean $)

Subgroup	Ice	Boat Fuel	Bait	Food	Truck Fuel	Misc.	Total
Full-time	26.59	45.96	35.88	17.50	9.47	0	135.40
Part-time	20.28	65.12	16.28	16.80	12.75	.11	131.43

Source: Hamilton and Huffman, "Cost Earnings Study of Hawaii's Small Boat fishery, 1995-1996.

4.3.1.4. Fixed Trip Costs

An important element of costs and returns to production analysis is the fixed costs associated with the commercial fishing operation. For this study, these costs include insurance, loan finance, and maintenance costs. Maintenance costs are not strictly fixed in reality. However, the intercept interview collected respondent estimates of average monthly maintenance costs and these costs are treated as fixed monthly costs.

Table 4.21 provides statistics on fixed costs. One of the most interesting findings is that none of the full-time and only one of the part-time vessels intercepted are insured. Also of interest is that only fifteen percent of full-time and fourteen percent of part-time vessels are paying off a loan for the vessel. Note also that the single vessel with insurance reports paying $100 per month or $1,200 per year.

All vessels reported that they incur monthly maintenance costs. The average monthly maintenance cost for full-time and part-time vessels were nearly identical at $87.69 and $86.79 respectively. This is surprising because full-time fishermen reported making considerably more trips per month than part-time fishermen did. One might expect that more frequent trips would

cause greater wear on full-time vessels; however, these maintenance costs don't support that expectation. These fixed costs are summed by vessel to calculate a monthly fixed cost per vessel.

To estimate trip profitability it is necessary to calculate per trip fixed cost for each vessel. This is done by dividing the vessels reported monthly fixed cost by the number of trips the vessel operator reported taking per month. In this way, fixed cost is assigned on a per trip basis. Table 4.22 presents statistics on per trip fixed cost, variable cost, and total cost. What is most striking about these statistics is that the average fixed cost for part-time vessels is nearly three times greater than for full-time vessels. In contrast, full time vessel average variable cost per trip is approximately thirty-four percent higher for part-time vessels.

Table 4.21: Fixed Costs Assigned Per Trip (% and $)

Subgroup	Statistic	Insurance cost	Loan cost	Maintenance cost	Monthly fixed cost
Full-time	**percent**	0	15	100	
	average		400.00	87.69	149.23
	stddev		282.84	51.34	178.44
	median		400.00	50.00	100.00
	max		600.00	200.00	700.00
	min		200.00	40.00	40.00
Part-time	**percent**	7	14	100	
	average	100.00	360.00	86.79	145.36
	stddev		127.28	93.43	161.85
	median		360.00	50.00	50.00
	max		450.00	300.00	500.00
	min		270.00	20.00	20.00

Source: Intercept Interview Data

On trips taken by full-time vessels, fixed costs per trip are only six percent of the total per trip cost. Fixed costs accounted for twenty percent of the total per trip cost for part-time vessels. Thus, part-time vessels appear to be burdened with greater average fixed costs on a per trip basis and this may contribute to differences in profitability of trips taken by the two subgroups that is discussed in section 4.3.1.6.

Table 4.22: Average Costs per trip. (% and $)

Subgroup	Statistic	Fixed Costs	Percent of total	Variable Costs	Percent of total	Total Costs
Full-time	**average**	6.46	0.06	98.70	0.94	105.16
	stddev	7.40		33.88		38.67
	median	4.00		95.00		97.50
	max	29.17		200.00		229.17
	min	1.67		48.00		53.00
Part-time	**average**	16.05	0.20	65.35	0.80	81.40
	stddev	14.28		34.35		44.59
	median	10.00		75.00		78.13
	max	50.00		137.00		187.00
	min	2.00		17.00		21.00

Source: Intercept Interview Data

4.3.1.5. Trip Harvest Characteristics

Vessel operators were asked to estimate their total monthly catch of pelagics, bottomfish, and reef fish. As shown in table 4.23, The average monthly full-time vessel landing of pelagics is 3,253.83 pounds but is only 658.57 pounds for part-time vessels. The full-time vessel minimum of 1,000 pounds per month is more than ten times greater than the minimum for part-time vessels The maximums for the two subgroups differ similarly. Perhaps most interesting is that the full-time median of 2,500 pounds for the full-time group is five times greater than the corresponding part-time vessel median and exceeds the part-time maximum observation by 1,000 pounds. These findings illustrate large differences in pelagic harvest levels between full and part-time vessels and are consistent with the large differences in monthly trip totals reported previously.

Very few boats in the commercial pelagics group reported targeting and harvesting reef and/or bottom fish. In fact, none of the full-time commercial pelagic boats reported harvests of reef fish. In the course of the study, there were several bottomfish and reef fish boats intercepted. However, they were grouped separately from the pelagic boats so their harvests are not included here. The statistics for bottomfish and reef fish listed in table 4.23 should be considered incidental harvest by the pelagic fleet.

Table 4.23: Monthly Harvest Statistics (lbs)

Subgroup	Statistic	Pelagic lbs/month	Bottom lbs/month	Reef lbs/month
Full-time	**average**	3,253.85	950.00	N/A
	stddev	2,394.65	574.46	
	median	2,500.00	1,000.00	
	max	10,000.00	1,600.00	
	min	1,000.00	200.00	
Part-time	**average**	658.57	200.00	90.00
	stddev	484.40	167.71	84.85
	median	500.00	150.00	90.00
	max	1,500.00	600.00	150.00
	min	70.00	50.00	30.00

Source: Intercept Interview Data

It is important to recognize that the harvest of the commercial pelagic fleet is not all sold commercially. In order to provide evidence of this the intercept interview asked fishermen what they did with their catch. The positive response frequencies for each category are shown in table 4.24. The question format allowed fishermen to choose each category of usage that applied to them. However, if an operator responded that they sold everything they did not indicate any other usage. Forty-six percent of full-time and seven percent of part-time operators responded that they sold everything. The respondents that did not sell everything indicated their catch usage from among the other usage categories and many chose more than one usage. None of the operators, however, indicated that all the fish were taken home and eaten. Only thirty-eight percent indicated giving some fish to crew. All part-time operators that did not sell all their fish sold some fish and most also ate some and gave some to crew. In addition, sixty-four percent of part-time operators that did not sell all their fish reported giving fish away to friends and neighbors.

Table 4.24: Usage of Catch (% of responses)

Subgroup	All sold	Some sold	Some eaten	All eaten	Some given to crew	Some given to friends and neighbors
Full-time	46	54	54	0	38	15
Part-time	7	93	86	0	86	64

Source: Intercept Interview Data

Statistics presented above have shown that not all trips result in sales of fish and when fish are sold not all the fish are sold. To determine how much of each type of fish are actually sold, the intercept interview asked fishermen to indicate the percentage sold of each type of fish they caught during the past year. On average, full-time operators reported selling almost all of their pelagic catch but only about two-thirds of their bottomfish catch. There are no statistics presented for reef fish for full-time operators because they did not report any reef fish catch. Part-time operators reported an average sales percentage for pelagic fish of about seventy-eight percent but sold slightly less than sixty-percent of bottomfish and only about twenty-seven percent of reef fish.

Table 4.25: Percent Of Fish Sold

Subgroup	Pelagic	Bottomfish	Reef Fish
Full-time	96	66	n/a
Part-time	78	59	27

Source: Intercept Interview Data

The intercept interview also gathered data on the type of fish that was targeted by each vessel on each trip. The primary target for both full and part-time vessel trips is tuna. To local fishermen, tuna generally refers to skipjack tuna. Thus, seventy-six percent of full-time vessel trips and sixty-seven percent of part-time vessel trips targeted surface swimming skipjack tuna. The remaining twenty-four percent of full-time vessel trips are evenly split among mixed targets of tuna/bottomfish, tuna/mahi/wahoo, and tuna/yellowfin. However, part-time vessel trips targeted the tuna/mahi/wahoo group twenty-six percent of the time with the remaining seven percent of trips targeting tuna/bottomfish.

It is important to understand that these categories were responses to the open ended question of what kind of fish were targeted. Thus, fishermen appear to make some distinction between a "tuna" trip and a general pelagic trip that might catch mahimahi, wahoo, or yellowfin. Also important to note is that the study period spanned a mahimahi season that fishermen reported to be the worst in many years. Thus, few mahimahi were observed in the catch. Another factor in these trip targets is the fact that yellowfin and wahoo are not as common as skipjack in the waters of the CNMI. If a fishermen targets these less common fish he may run more risk of not making a profit on the trip than if he targets more easily located skipjack schools.

Table 4.26: Trip Targets (%)

Subgroup	Tuna	Tuna/ bottomfish	Tuna/Mahi/ Wahoo	Tuna/ Yellowfin
Full-time	76	8	8	8
Part-time	67	7	26	0

Source: Intercept Interview Data

The intercept interview collected data on catch per trip in order to estimate per trip returns. It is important to understand that fishermen were asked to provide the number and weight of pelagic,

bottom, and reef fish. In survey pretests, this part of the intercept survey was more detailed and attempted to actually view the fish and count them. However, this procedure proved contentious and was modified to allow each fisherman to provide his estimate of number and poundage.

Attempts were made to view the catch in order to determine whether multi-species catches were common. There was some concern that categorizing all pelagics together would cause problems with revenue estimatio because of significant differences in prices between skipjack tuna and the other pelagics. However, there were only two vessels with other pelagic species. One vessel had several wahoo and one had several yellowfin. The vessel operator that had yellowfin was selling them at the same price as skipjack and the vessel operator that caught the wahoo kept the fish for his own consumption. It is important to note that mahimahi may be an important revenue component in years when the harvest is larger. However, several fishermen reported having difficulty selling mahimahi so it is difficult to assess the potential for improved profitability of trips due to improved mahimahi catch. What can be said is that the revenue estimates created from the data are virtually void of revenue from species other than skipack tuna.

Table 4.27 presents statistics on catch per trip, which show that all of the trips taken by full-time vessels and ninety-six percent of the trips taken by part-time vessels resulted in catch of pelagic fish. Only eight percent of full-time trips resulted in catch of bottomfish. This is consistent with data presented previously showing that full-time fishermen utilize a surface trolling method and do not target bottomfish. None of the full-time vessel trips targeted or caught reef fish. Nineteen percent of bottom fish catch for the part-time subgroup indicates that part-time vessels catch more bottomfish than full-time vessels. This holds true for reef fish with four percent of the part-time vessel trips resulting in reef fish catch as compared to none for full-time vessel trips.

On average, full-time vessel trips resulted in around 32 pelagic fish per trip with an average weight of 173 pounds. Part-time vessel trips resulted in less than half of that amount with nearly 15 pelagic fish caught per trip on average. The average weight of pelagic catch for part-time vessel trips was around 82 pounds. The median for pelagic catch on full-time vessel trips is 20 fish, which is double the median for part-time vessel trips. Median pounds of pelagic fish is 110 pounds for full-time vessel trips and is also nearly double the median of 60 pounds for part-time vessel trips. These statistics suggest that there is great variability in catch rate of pelagic fish within and between vessels in the subgroups. The full-time subgroup tends to catch more fish on average and more than half of the full-time trips resulted in greater catch than the average catch for part-time trips.

Unlike the part-time subgroup, none of the full-time trips resulted in zero catch of pelagic species. However, the lowest catch in the full-time subgroup was only four fish. This is interesting given that both groups tend to spend, on average, nearly the same amount of time fishing on each trip. Data presented previously on experience in the fishery do not show much difference between the two subgroups. However, experience was measured in years without regard for the days per year spent on the water. A year of full-time experience is likely more beneficial than a year of part-time or recreational experience. Full-time fishermen may have an advantage in that they are on the water frequently and are aware of the daily movements of fish schools.

The averages for bottomfish catch on the eight percent and nineteen percent of full and part-time vessel trips respectively where bottomfish were caught show little difference in number caught but considerable difference in the pounds caught. On full-time vessel trips when bottomfish were caught the average number caught was 17.5 fish and the average reported poundage was 150 pounds. On part-time vessel trips when bottomfish were caught the average number caught was 16.2 fish; however, the average poundage was only 41. Despite the average number caught being

quite similar, the average bottomfish poundage for the part-time subgroup was less than a third of the poundage for the full-time subgroup. None of the full-time vessels reported catch of reef fish and one part-time vessel reported harvest of 100 reef fish at a total weight of 50 pounds.

Table 4.27: Catch Per Trip

Subgroup	Statistic	Pelagic number	Pelagic lbs.	Bottom number	Bottom lbs.	Reef Number	Reef lbs.
Full-time	**percent**	100		8		0	0
	average	31.84	173.00	17.50	150.00		
	stddev	26.43	145.77	3.54	70.71		
	median	20.00	110.00	17.50	150.00		
	max	100.00	500.00	20.00	200.00		
	min	4.00	20.00	15.00	100.00		
Part-time	**percent**	96		19		4	
	average	14.89	81.85	16.20	41.00	100.00	50.00
	stddev	17.17	86.18	17.31	41.59		
	median	10.00	60.00	6.00	20.00		
	max	87.00	400.00	45.00	110.00		
	min	0.00	0.00	5.00	10.00		

Source: Intercept Interview Data

Data from the CNMI Division of Fish and Wildlife (DFW) dealer invoicing system has been used by the Western Pacific Regional Fisheries Management Council to compile catch, effort, landings, and revenue statistics from 1983 through 1998(WPRFMC, 1999). This system relies on information voluntarily provided by fish dealers on the amount and type of fish purchased. It is interesting to compare the estimated catch per trip from intercept interview data collected for this study with estimated catch per trip from the dealer invoice system.

Table 4.28: Pelagic Troll Fishery: Per Trip Catch Rate (lbs)

Year	Mahimahi	Wahoo	Marlin	Skipjack	Yellowfin
1983	7.92	4.98	2.15	104.21	12.09
1984	3.73	6.90	0.76	142.40	9.59
1985	8.02	11.29	1.15	109.75	7.71
1986	10.50	5.35	1.57	150.07	9.98
1987	7.61	10.73	1.97	129.33	8.37
1988	18.87	7.17	0.80	163.25	9.42
1989	4.60	0.99	3.59	162.08	6.36
1990	9.13	3.04	1.92	130.55	9.20
1991	26.95	1.21	1.32	92.46	10.41
1992	14.79	9.47	3.68	45.47	14.25
1993	21.80	1.64	2.14	56.48	8.65
1994	9.82	2.53	1.73	60.42	8.68
1995	10.80	2.64	3.07	61.04	9.74
1996	12.65	3.83	3.05	58.63	13.49
1997	12.21	2.96	2.76	52.08	8.35
1998	9.21	2.26	1.51	60.01	5.23
Average	**11.79**	**4.81**	**2.07**	**98.64**	**9.47**

Source: Western Pacific Regional Fisheries Management Council. "Pelagic Fisheries of the Western Pacific Region, 1998 Annual Report." December 1999, WPRFMC, Honolulu.

According to the DFW data, pelagic troll trips taken from 1983 to 1998 yielded on average of 98.64 pounds of skipjack, 11.79 pounds of mahimahi, 9.47 pounds of yellowfin, 4.81 pounds of wahoo, and 2.07 pounds of marlin for a total of 126.78 pounds per trip. The combined average of full-time and part-time vessel per trip harvests of pelagic species in this study is 127.43 pounds, which is almost identical to the DFW 1983-98 average annual harvest.

In contrast to the 1983-98 long term average DFW data show a total pelagic harvest of 78.22 pounds per trip in 1998. This is considerably less than either the 81.85 pounds per trip for part-time vessels or the 173 pounds per trip reported by full-time vessel operators intercepted in this study.

4.3.1.6. Estimation of Trip Profitability

The pelagic fishermen of the CNMI utilize several marketing methods to sell their fish. Some fishermen make selling arrangements prior to the trip and others set prices at dockside and roadside depending on market quantities. Thus, each fisherman has a price expectation based on his own selling arrangement. In the intercept interview each vessel operator was asked to provide his expected ex-vessel price for the type of fish he caught.

Revenue estimation in this study utilizes the ex-vessel price expectation the fisherman indicated. An obvious exception to the use of price expectation is in the price sensitivity analysis, which purposely varies prices. Multiplication of the pounds of fish harvested by the expected price on each trip yields per trip potential revenue. It is important to understand that this is a potential revenue estimate because fishermen reported difficulty selling all their fish. Thus, the potential revenue estimates provide an indication of what the fishermen could earn if they were able to sell all the fish they catch and at the expected price.

The intercept interview also asked fishermen to estimate the percentage of their fish that they actually sell. The sales percentages reported by the vessel were multiplied by reported harvest to calculate "actual" estimated revenue. In the tables that follow, the potential and actual estimates are presented, discussed and compared. Of course, the "actual" estimates assume that the sales percentages indicated by fishermen are accurate representations of actual sales percentages.

Table 4.29: Estimated Potential Returns Per Trip

Subgroup	Statistic	Pelagic	Bottom	Reef	Total
Full-time	**percent**	100	8	0	
	average	326.90	450.00		362.90
	stddev	253.46	212.13		245.20
	median	200.00	450.00		340.00
	max	1,000.00	600.00		1,000.00
	min	40.00	300.00		50.00
Part-time	**percent**	96	19	4	
	average	167.64	104.00	100.00	191.53
	stddev	176.29	103.71		207.82
	median	120.00	60.00		120.00
	max	800.00	275.00		800.00
	min	0.00	15.00		0.00

Source: Intercept Interview Data

Statistics on average potential returns per trip are presented in Table 4.29. The percent statistics indicate the percent of trips within each subgroup that had positive potential revenues from each fish type. The average per trip potential revenue earned from pelagic fish catch was $326.90 on full-time but only $167.64 on part-time trips. Median and range statistics show that half of the full-time trips generated between $200 and $1,000 in potential pelagic revenue and half generated between $40 and $200. Part-time vessel trips had median potential pelagic revenue of $120, indicating that half the trips generated between $120 and $800 and half generated pelagic less than $120 per trip.

Bottomfish potential revenues averaged $450 per trip for the eight percent of trips when full-time vessels caught bottomfish. The average for part-time vessels that caught bottomfish was only $104 per trip. As discussed previously, the average pounds of bottomfish caught is three times larger for full-time vessel trips than for part-time vessel trips even though the average number caught is similar. Thus, the difference in revenue is attributable to the difference in weight as bottomfish prices were observed to be quite static during the study. Reef returns amounted to a single part-time trip potential return of $100.

The total potential revenue statistics indicate that full-time vessel trips average $362.90, while part-time vessel trips generate an average of $191.53. Note that the averages for the fish types do not add up to the total revenue average because the statistics presented for bottomfish and reef fish represent the statistics for only those trips with positive catch. The median total potential revenue for full-time trips of $340 is quite close to the average. However, the part-time potential total revenue median of $120 is considerably less than the associated average for part-time vessel trips.

Table 4.30 provides statistics on estimated actual returns based on the percentages of each fish type respondents indicated they actually sell. Comparing the averages one can see that the actual returns for pelagics are only slightly less than the potential return estimates. However, the bottomfish actual return average is only $27.00 and $65.60 per trip for the full and part-time subgroups respectively. These low actual returns are due to the fact that the trips with largest bottomfish catch appear to have been taken by vessel operators who do not sell a large proportion of bottomfish. Thus, the potential revenue numbers far exceed the actual revenue numbers for bottomfish.

Table 4.30: Estimated Actual Returns Per Trip

Subgroup	Statistic	Pelagic	Bottom	Reef	Total
Full-time	**percent**	100	8		
	average	315.68	27.00		321.08
	stddev	244.13	40.25		238.47
	median	198.00	0.00		198.00
	max	900.00	90.00		900.00
	min	38.00	0.00		49.50
Part-time	**percent**	96	19	4	
	average	136.00	65.60	87.50	151.38
	stddev	143.16	78.89		160.64
	median	105.00	40.50		108.00
	max	640.00	192.50		640.00
	min	0.00	0.00		0.00

Source: Intercept Interview Data

It is useful to compare the per trip revenue estimates derived from intercept interview data with estimates made using the CNMI-DFW dealer invoice system data. Table 4.31 presents the dollar value of combined pelagic harvests from 1983 to 1999 from the DFW dealer invoice system. The data are presented in unadjusted form as well as in inflation adjusted form using the CNMI consumer price index with a base year of 1998. What is immediately obvious is that the inflation adjusted long term average of $315 is almost identical to the per trip revenue of full-time fishermen calculated from interview data. Another interesting fact is that the average of the full-time and part-time per trip revenue numbers is approximately $226 per trip and is similar to the $244 per trip for 1998 estimated from CNMI-DFW data.

Table 4.31: Pelagic Fishery Revenues Per Trip ($)

Year	All Pelagics	
	Unadjusted	Adjusted
1983	159	299
1984	183	315
1985	189	314
1986	262	425
1987	292	453
1988	315	462
1989	279	388
1990	289	384
1991	295	363
1992	228	258
1993	192	210
1994	197	209
1995	198	206
1996	256	259
1997	250	250
1998	244	244
average	**239**	**315**

Source: Western Pacific Regional Fisheries Management Council, 1999

The next step in the costs and returns analysis is to net the total costs per trip against returns to determine trip profitability. This is done for both the potential and actual returns estimates discussed above. The statistics shown in table 4.325 are calculated from these trip level data. It is important to note that net return per person is an actual representation of crew shares for most of the trips.

As shown in table 4.32, full-time vessel trips averaged $257.74 in potential net per trip return, while part-time vessels averaged $110.13. Eighty-eight percent of full-time and seventy-four percent of part-time trips could have resulted in positive net returns. The median statistics show that half the full-time trips would have earned net returns between $242.50 and $897.50, while half were less than $242.50. The minimum value of -$77.08 for full-time trips also points out that some of the full-time vessel trips ended in net losses.

Potential net returns for part-time vessels are not nearly as large as for full-time vessels. Twenty-six percent of part-time trips would have ended in losses with the greatest loss reported as $147. Half of the seventy-four percent of part-time trips with positive returns would have earned between $62.38 and $703.00. However the other half of the trips with positive returns would

have earned only from zero to $62.00. The full-time trip subgroup median is nearly four times this amount.

Table 4.32: Potential and Actual Net Returns Per Trip

Subgroup	Statistic	Potential Net Return	Actual Net Return
Full-time	**percent profitable**	88	88
	average	257.74	215.92
	stddev	233.20	221.37
	median	242.50	119.00
	max	897.50	797.50
	min	-77.08	-95.83
Part-time	**percent profitable**	74	70
	average	110.13	69.99
	stddev	203.31	158.89
	median	62.38	53.88
	max	703.00	543.00
	min	-147.00	-167.00

Source: Intercept Interview Data

Table 4.32 also provides statistics on actual net returns per trip. Comparing the potential net return figures with the actual net return figures makes it clear that there is a considerable decrease in net returns when the actual sales adjustment is made. Average potential net returns per trip for the full-time subgroup fell from $257.74 to $215.92, which is a sixteen percent reduction. The average potential net returns per trip for the part-time subgroup fell from $110.13 to $69.99, which is a thirty-seven percent decrease. Interestingly, the percentage of trips that resulted in positive net returns did not change for the full-time subgroup and only decreased by four percent for the part-time subgroup. Thus, while the profit levels decreased when the actual sales analysis was applied, there was not much effect on whether trips resulted in positive returns or not.

4.3.1.7. Price Sensitivity Analysis

Pelagic fish prices in the CNMI have exhibited historic fluctuations (see section 4.5). In addition, prices observed during the course of this study have ranged from $1.00 per pound for frozen tuna to $2.25 per pound for fresh tuna at dockside. Given these fluctuations, it is appropriate to analyze the price sensitivity of net returns. That analysis has been conducted for both potential and actual returns with price changes for pelagic fish from $2.25 per pound to $1.00 per pound in $.25 increments. Since little variability was observed in the price of reef and bottomfish during the study, and catch of these fish has only an incidental impact on total revenue, this analysis does not vary the price for reef and bottomfish.

Table 4.33 presents the results of the price sensitivity analysis on potential net returns per trip. It is important to understand that the percent change in the statistics shown do not equal the percent change in the prices shown. That is because the full affect of the price change is only on pelagic harvest revenue. The percent change in revenue calculated for each trip does equal the percent change in price. However, what is shown here is net revenue, which includes any revenue from reef or bottomfish and is net of both the fixed and variable costs for the trip.

The price sensitivity analysis for potential net returns shows a decline in full-time vessel average per trip potential revenue from about $320 to about $104. Part-time vessel average potential net revenue per trip falls from about $127 to about $24.

Table 4.33: Potential Net Returns: Price Sensitivity Analysis

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	92	92	84	84	72
	average	320.09	276.84	233.59	190.34	147.09	103.84
	stddev	295.58	263.47	232.65	203.68	177.49	155.49
	median	242.75	205.25	167.75	130.25	92.50	42.50
	max	1,022.50	897.50	772.50	647.50	557.00	552.00
	min	-39.58	-52.08	-64.58	-77.08	-89.58	-102.08
Part-time	**percent**	78	74	74	63	63	52
	average	126.66	106.19	85.73	65.27	44.81	24.34
	stddev	212.92	193.34	174.23	155.75	138.17	121.86
	median	92.25	77.25	61.00	41.88	21.88	1.88
	max	803.00	703.00	603.00	504.17	466.67	429.17
	min	-142.00	-147.00	-152.00	-157.00	-162.00	-167.00

Source: Intercept Interview Data

By reviewing the percent statistics of table 4.33 one can see that ninety-six percent of full-time trips, and seventy-eight percent of part-time trips would result in positive returns when price is $2.25 per pound. At both the $2.00 and $1.75, ninety-two percent of the full-time trips and seventy-four percent of the part-time trips would have resulted in positive net returns. At $1.50 and $1.25, eighty-four percent of the full-time and sixty-three percent of the part-time trips would have resulted in positive returns. What is interesting about these data is that from $2.25 to $2.00 there is only a small change in profitability of trips and significant changes in the percent of profitable trips only occur when price changes by $.50 per pound. This tendency is exhibited in actual returns as well. Average per trip actual returns for full-time vessels are seen to fall from about $276 to about $67, and decreased from $82.82 to just fourteen cents for part-time vessels.

Table 4.34: Actual Returns: Price Sensitivity Analysis

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	88	88	8	8	64
	average	276.19	234.42	192.64	154.21	109.10	67.33
	stddev	292.003	256.75	221.60	189.40	151.88	117.67
	median	143.75	119.00	94.25	71.48	45.75	24.75
	max	943.83	818.83	693.83	581.50	460.00	347.50
	min	-67.71	-77.08	-86.46	-95.08	-105.21	-114.58
Part-time	**percent**	74	70	59	59	59	37
	average	82.82	66.29	49.75	34.54	16.68	0.14
	stddev	168.75	152.68	136.97	122.97	107.32	93.93
	median	58.38	50.67	40.17	28.62	11.00	-2.00
	max	623	543.00	463.00	389.40	303.00	264.17
	min	-164.5	-167.00	-169.50	-171.80	-174.50	-177.00

Source: Intercept Interview Data

Perhaps more illuminating are the median statistics of the price sensitivity of actual net returns (table 4.34). Median per trip actual net returns for the full-time subgroup drops from $143.75 to

$24.75 as a result of the price decline. What this shows is that more than half the trips of the full-time subgroup are profitable even at the price of $1 per pound. In contrast, the median actual net returns for the part-time subgroup drops from $58.38 to -$2, which shows that at least half the trips would not be profitable at the one dollar per pound price.

4.3.2. Problems Encountered

A significant problem encountered in conducting the research for this analysis was that the participation in the pelagic fishery was much lower than expected. A small group of vessels were observed to be frequent participants, however, many vessels were not seen very frequently at all. Some were only encountered on the day the intercept interview took place.

The low participation numbers made intercepting active vessels a challenge. Vessel trailers do not have license plates and the trucks that are used to haul the vessel to the ramp are often disconnected from the trailer and used during the day by other family members. Further, many of the trailers are nearly identical. Thus, it was not possible to make any determination from the trailers in the parking lot whether they belonged to vessels that had already been intercepted. Many hours were spent at dockside waiting for vessels to come in only to observe that the vessels had already been intercepted. Thus, many more field hours than expected were necessary to obtain the intercept data for the study.

In addition to the low participation numbers, some operators did not want to be interviewed. Fifteen refusals were recorded during the study. In most cases the fisherman refusing to be interviewed simply did not want to take the time to conduct the interview. However, some refusals appeared to be related to low catch for the vessel.

4.3.3. Conclusions and Recommendations.

The current pelagic fishery of the CNMI is a daily small boat surface-trolling fishery that delivers a fresh product to market. The existing vessels are trailered sportfishing style vessels from 14 to 23 feet in length and are powered by gasoline engines ranging from 10 to 230 horsepower. Vessel operators reported taking trips as far as 50 miles offshore, however the average trip is less than twenty miles offshore. These vessels have very limited amenities, no refrigeration, and limited electronics.

Most of these vessels currently operating in the CNMI pelagic fishery are not capable of being outfitted with gear other than rod and reel gear and are not capable of extended trips. It is conceivable that the larger vessels in operation might be able to use small-scale longline methods similar to the American Samoa Alia methods. However, even the largest vessels intercepted are lacking in chilling capability to hold the yellowfin, bigeye, and marlin that would likely be their target catch in a longline fishery. If these vessels are not able to properly chill longline catch they may not be able to compete on a quality basis with high quality yellowfin imports from Guam (see section 4.5).

This study did not investigate the operations of bottomfishing vessels in the CNMI. However, in the course of this research, it was observed that there are several bottomfishing vessels that could be outfitted with modern style longline gear. This potential was discussed with operators of several large bottomfishing vessels. However, their knowledge of the longline method was lacking. Further, they made the point that bottomfish, such as grouper or onaga fetch market prices of about $4.50 per pound as compared to the $2-$2.50 per pound that tuna brings. Thus, they did not see the point in investing in much more expensive gear to chase less valuable fish.

The analysis has found that the existing small boat pelagic fishery is generally profitable for a large majority of participants. Even with potential declines in ex-vessel prices, most participants still make a profit. However, profitability is highly dependent on the cost of fuel. Fuel was found to be the largest component of per trip variable costs and the locally high price of gasoline is effectively eating into fishing profits. Fishermen would benefit greatly by fuel price relief. Such relief could be in the form of a liquid fuels tax rebate for commercial fishing vessels. Alternatively, a cooperative or association might be able to negotiate volume discounts for its members. Ultimately, conversion of vessel power from gasoline to diesel engines may be the answer as diesel engines are more efficient. However, power plant conversion would likely require a greater level of investment and some additional work on the feasibility of such conversions is warranted.

The study has found that full-time operators tend to have lower fixed costs than part-time operators. However, full-time operators have higher variable costs and this is likely due to increased fuel use on the slightly longer trips taken by full-time operators. The study has also found that full-time operators tend to be focused more on making a profit than part-time operators and are much more likely to sell all their catch. However, both subgroups are not able to achieve their potential revenues because they cannot sell everything they catch.

The data show that catch varies between the subgroups with full-time vessels tending to catch more fish per trip. However, the subgroups exhibited similar vessel and gear characteristics, trip lengths, and experience levels. Thus, it seems that there is a difference in catchability between the two subgroups. That difference may simply be due to the fact that full-time fishermen are on the water more frequently than part-time fishermen so they may have better knowledge of the location of tuna schools. It may be possible to model catch rates using an econometric Poisson or Negative Binomial model of catch as a function of vessel and crew characteristics. Such an analysis might provide useful insight into the potential success or failure of new entrants based on their qualifications and is a recommended topic for more advanced statistical analysis

As mentioned in the section on problems encountered, the study suffered from low participation levels in the fishery that limited the number of observations in the data set. It would be of great benefit for potentially ongoing research on vessel costs and returns to adopt a logbooks and fish ticket system. These systems would be a great improvement over the existing CNMI-DFW voluntary dealer invoice system, which relies on fish buyers to provide data on their purchasing. While the finding of this study on harvest per trip and per trip revenues are in general agreement with estimates made using the DFW data, participation and activity levels in the fishery discussed in section 4.4 are not in agreement.

This study finds that there may be a much greater volume of fish being harvested than estimated by CNMI-DFW. However, there is no way to easily verify whether reported numbers of trips taken or reported harvests are accurate. If vessels carried logbooks this question would be easily answered. Further, licensing of commercial fishing operators, vessels and crew, would help with conducting this kind of research by identifying the participants. Availability of contact information for known participants could potentially eliminating the need to utilize intercept interviews and may allowing enterprise level analysis of the fishing operations. A much more detailed analysis of labor could also be accomplished.

4.4. LABOR MARKET CONDITIONS

An objective of this study was to assess the economic conditions in the fishery labor market in the CNMI. The fundamental questions are whether there is a constraint on labor availability and what are the economic returns to labor in the current fishery. The findings of that assessment are presented below.

4.4.1. Accomplishments and Findings

Table 4.35 presents a summary of labor participation based only on the vessels intercepted. While some vessels were manned by only the operator, the average number of crew on board was 2.20 and 2.33 for full and part-time commercial vessels respectively. In total, 21 crew worked on full-time vessels and 15 on part-time vessels. The vessels surveyed account for 36 crew and 27 operators not including the 15 operators who refused to be interviewed. CNMI-DFW data indicate that there are 87 vessels involved in full-time commercial fishing. Thus, the labor participation numbers shown in table 4.35 may be an underestimate of total participation in the commercial pelagic fishery of the CNMI.

Of particular interest is the estimate of annual trips made by each subgroup. The estimate is calculated by multiplying average monthly trip totals per vessel for each subgroup by the number of vessels in each subgroup and then by twelve to estimate annual totals. As is shown in table 4.35, the thirteen full-time vessel operators reported taking 3,552 trips annually, while the fourteen part-time vessel operators intercepted reported taking 1,668 trips per year. In total, the twenty-seven vessels intercepted account for 5,220 trips annually. This is in sharp contrast to the 1998 trip total of 2,230 reported by the Western Pacific Regional Fisheries Management Council using CNMI DFW data (WRPFMC, 1999). The disagreement in these numbers suggests that either the vessel operators overestimated their trip totals and/or the CNMI DFW data do not fully account for actual trips taken.

Table 4.35: Labor Participation in the Pelagic Commercial Fishery of the CNMI.

Subgroup	Captain or Operator	Crew Members	Total	Annual Trips
Full-time	13	21	34	3,552
Part-time	14	15	29	1,668
Totals	27	36	63	5,220

Source: Intercept Interview Data

Data compiled from the CNMI Division of Fish and Wildlife's dealer invoicing system also suggests that the intercept interview used in the current study may not have captured all of the pelagic operators. Table 4.36 shows the number of fishermen landing pelagic species, number of trips, landings, prices, and revenues from 1983 through 1998. However, specific designation of operator vs. crew is not provided in the data. It is quite possible that some crewmembers sell fish as do charter fishing operators and crew. In addition, fishermen that might otherwise be considered recreational but sell fish following a large catch may be included in these numbers. Thus, it is unclear exactly how many of the fishermen that were recorded as landing pelagic species are actively involved in the pelagic commercial fishery.

Table 4.36: Annual Participation, Landings, and Revenue, 1983-98*

Year	participants	trips	landings	Price	revenue
1983	92	1,408	196,788	0.99	198,710
1984	97	1,634	272,909	0.95	264,203
1985	75	1,293	187,378	1.02	195,372
1986	96	1,356	245,907	1.07	267,013
1987	60	999	164,055	1.14	190,150
1988	77	1,306	267,619	1.20	327,260
1989	77	1,272	229,427	1.29	299,142
1990	77	910	144,862	1.56	235,520
1991	74	1,002	150,915	1.80	271,030
1992	105	1,451	162,691	1.91	305,927
1993	54	1,378	145,115	1.78	249,136
1994	66	1,221	117,668	1.75	207,124
1995	89	1,727	160,540	1.80	289,740
1996	114	2,254	224,962	1.89	431,560
1997	107	2,050	174,914	2.20	379,620
1998	89	2,230	192,568	2.02	398,086
average	**84**	**1468**	**189,899**	**1.52**	**281,086**

Source: Western Pacific Regional Fisheries Management Council. 1999
*Prices and revenues are not inflation adjusted

What is most interesting about the data presented in table 4.36, above is that there appears to be a cyclical pattern to the fishery participation numbers that is related to prices. In the early 1990's, prices were steadily increasing as were the number of trips per year, landings and revenues. Participation numbers on the other hand were effectively constant from 1988 to 1991 but increased dramatically in 1992 when 104 participants were recorded and 1451 trips were reportedly taken. Landings and revenue also peaked in 1992. From 1992 to 1993, prices fell and there was a fifty percent decline in participant numbers. Landings also fell by eleven percent and revenues fell by eighteen percent. However, the number of trips taken only declined by five percent during this period.

Price fell slightly again in 1994 before beginning a steady rise and eventually peaking at $2.20 per pound in 1997, which was also the peak of the local economic boom. During that price rise, participation rose from 54 in 1992 to 114 in 1996 before falling to 107 in 1997. Trips also rose to peak at 2,254 trips per year in 1996, fell to 2,050 in 1997 and rebounded to 2,230 in 1998. In 1998, prices fell by nearly ten percent and participation rates also fell to 89. Though data is not yet available for 1999, the results of analysis of prices from the intercept interview (see table 4.57) shows that average prices have remained relatively constant at near $2 per pound since 1998.

These data show that there is considerable change from year to year in participation in the pelagic fishery. Participation appears to be closely related to price changes, which are of course indicative of profitability in the fishery. Further, there appears to be a cycle of expanded effort in the fishery when prices rise. However, each peak of effort and harvest tends to be followed by declines in price and participation rates. This pattern suggests that labor participation changes due to economic conditions in the fishery and that labor is readily expanded when economic conditions warrant participation. It does not appear, from these data at least, that labor is constrained in availability but rather by the profitability of the enterprise.

4.4.1.1. Pelagic Fishery Crew Characteristics

As shown in table 4.37, full-time vessel crews average nearly twenty years of combined fishing experience and nearly nineteen years locally. None of the full-time crew hold other jobs and thirty-eight percent of the crew are guest workers in the CNMI. Full-time vessel crew formal education averaged just under 12 years and the median was 12 years indicating at least half of all full-time crew had a high school education or greater, while the other half completed between ten and twelve years of education. The low standard deviation of .92 is further indication that a high school education is the norm among crewmembers.

Part-time vessel crews had slightly more combined experience than full-time crews. This is likely because the average number of crew on part-time vessels is higher than that of full-time vessels. Thus, their combined total experience level may be larger simply because there are more crewmembers. In contrast, the amount of local experience (experience in CNMI fisheries) of part-time crews averaged slightly less than the average amount of local experience for full-time crews. Fewer part-time crew were guest workers as well and eighty-six percent of part-time crewmembers hold another job. Education of part-time crew is very similar to full-time crew with a high school education being the norm.

Table 4.37: Years of Crew experience and Employment Status

Subgroup	Statistic	Crew Experience	Local Experience	Crew Education	Guest Worker Crew	Other job
Full-time	**percent**				38	0
	average	19.91	18.82	11.44		
	stddev	14.15	14.78	0.92		
	median	15.00	10.00	12.00		
	max	40.00	40.00	12.00		
	min	2.00	2.00	10.00		
Part-time	**percent**				21	86
	average	20.29	17.50	12.10		
	stddev	11.68	11.26	1.02		
	median	20.00	20.00	12.00		
	max	40.00	40.00	14.00		
	min	1.00	1.00	10.00		

Source: Intercept Interview Data

4.4.1.2. Crew Payment Methods

The dominant method of crew payment, as shown in table 4.38, was an equal share of the net trip revenue for each person on board the vessel including the owner or operator. Fifty-four percent of full-time and fifty-seven percent of part-time vessels used this method. There were also several vessels that operated with only the vessel operator and no additional crew. In such cases, crew pay is simply net revenue for the day and goes to the operator. Twenty-three percent of full-time vessels and fourteen percent of part-time vessels were single operator vessels. Sixteen percent of the full-time and seven percent of part-time vessels paid an hourly wage of $3.15 to $4.10 to their crew. Fourteen percent of part-time vessels paid crew with an equal share of the catch. Finally, seven percent of each of the full and part-time vessel operators reported that they pay crew an equal share of the gross revenue.

Table 4.38: Crew payment methods (percent using method)

Subgroup	Gross revenue share	Net Revenue share	Equal share of catch	Hourly wage	100% to Operator
Full-time	7	54	0	16	23
Part-time	7	57	14	07	14

Source: Intercept Interview Data

One of the surprising results of the interview questions on crew payment methods is that none of the vessel operators reported keeping a share for the vessel. The owner of the vessel appears to bear the complete burden of the capital investment but does not appear to directly earn a return on that investment in the crew share systems reported. If owners are not compensated for these costs they actually receive less income than their crew and this does not seem likely. It is more likely that the interview question on crew share payment systems did not successfully elicit details on the payment methods and that some owner payment system exists. This issue will be taken up in more detail below.

4.4.1.3. Commercial Sales Motivations

A major question that this study seeks to answer is whether some commercial vessels only sell enough fish to cover trip cost. To determine whether such behavior is occurring operators were asked to indicate the percent of trips when they sold fish to cover expenses, for profit, or all the fish. Table 4.39 provides percentages of responses for each category. As shown in the table, none of the full-time operators reported selling fish to cover trip costs while nearly a third of part-time trips resulted in sales to cover expenses. Eighty-five percent of full-time trips but only sixty-four percent of part-time trips result in sales for profit. Only fifteen percent of full-time trips and seven percent of part-time trips result in sales of all fish.

Table 4.39: Commercial Sales Motivation.

Subgroup	Sold To Cover Trip Cost	Sold For Profit	All Fish Are Sold
Full-time	00	85	15
Part-time	29	64	07

Source: Intercept Interview Data

Clearly, the vessel operators that self categorized as full-time commercial do behave as such. None of the full-time vessel operators reported selling fish only to cover trip costs. In contrast, nearly a third of the part-time vessel operators reported selling fish to cover the cost of their trip. However, just over two-thirds of the part-time vessel operators reported that they try to sell fish to make a profit not just to cover trip cost. These numbers are significant in that seventy-three percent of part-time trips are profit motivated. All combined, fully eighty-five percent of all commercial pelagic trips made by vessels intercepted are profit motivated.

4.4.1.4. Returns to Labor

An important consideration in analyzing the labor situation in fisheries is the return to labor. The fundamental question to be answered is whether those actively involved in commercial fishing are earning wages that are higher, comparable, or lower than wages that could be earned in their next best alternative employment. Such an analysis requires conversion of vessel net returns into an hourly wage. This is done by dividing net return per trip by the number of fishermen on board

the vessel and then dividing by the length of the trip in hours to obtain net return per hour. This has been done for both potential and actual returns and the statistics are shown in table 4.40.

Table 4.40: Potential and Actual Net Returns Per Hour (% and $)

Subgroup	Statistic	Potential Net Return per Hour	Actual Net Return Hour
Full-time	**percent**	92	88
	average	21.40	16.67
	stddev	25.79	21.91
	median	12.38	10.77
	max	112.19	99.69
	min	-3.95	-4.91
Estimated Average Annual Return		41,399	32,249
Part-time	**percent**	74	70
	average	9.59	6.25
	stddev	14.78	11.51
	median	5.88	4.66
	max	54.51	35.14
	min	-5.76	-9.50
Estimated Average Annual Return		6,696	4,364

Source: Intercept Interview Data

On average, full-time vessel trips result in potential net returns per hour of $21.40. The average potential net returns per hour for the part-time subgroup is only $9.59 or about half the return of the full-time subgroup. Note that the standard deviations exceed the averages and are indicative of negative returns on some trips. This is also shown in the range statistics, which indicate negative potential net returns per hour of as much as -$3.95 and -$5.76 for the full and part-time subgroups respectively. Note, however, that the maximums indicate that some trips can be quite profitable. The percent figures indicate the percentage of trips that had positive returns to labor. Ninety-two percent of the full-time vessel trips and seventy-four percent of the part-time vessel trips had positive returns based on potential revenues.

The statistics on actual net returns per hour show that the inability for operators to sell all their fish results in a reduction on the average returns to labor of approximately one third of their potential value. However, it must be understood that these averages are lacking in central tendency as is indicated by the high standard deviations. The range statistics show that some trips result in actual net return per hour of nearly $100 for the full-time subgroup and just over $35 for the part-time subgroup. The percentage statistics show that eighty-eight percent of full-time vessel trips resulted in positive actual returns, as did seventy percent of part-time trips.

The annual average return to labor is calculated by multiplying average return per hour by the average hours per trip and then by the average number of trips per year for each subgroup. This is done for potential and actual returns. As can be seen in table 4.40, full-time operators reported an average annual potential return of $41,399 and an average annual actual return of $32,249. Potential and actual average annual returns for part-time operators are only $6,696 and $4,364 respectively. This is expected considering that part-time operators report taking fewer trips than full-time operators. Thus, the estimated average pre-tax income potential for crew of full-time vessels is considerable but is also significantly constrained by not being able to sell all their catch.

Section 4.3.1.9 develops a price sensitivity analysis for trip returns. The price sensitivity analysis has also been applied to the potential and actual net returns per hour. As shown in table 4.41, the average potential net returns per hour for the full-time subgroup are as high as $25.79 when the pelagic price per pound is $2.25. Even at $1.00 per pound the average potential net returns per hour for the full-time subgroup is $9.61. The associated medians indicate that half of the full-time trips would generate net returns from $15.56 to as much as $127.81 per hour if the pelagic price is $2.25 per pound. The median falls to $3.41 per hour if the pelagic price falls to $1.00 per pound. The percent statistics show that ninety-six percent of the full-time trips generate positive returns at $2.25 per pound. Even at $1.00 per pound seventy-two percent of full-time vessel trips generated positive returns.

Statistics for the part-time subgroup show a different reality. As price falls from $2.25 to $1.00 per pound, the average potential net returns per hour that would be generated from part-time trips falls from $10.65 to $2.01 per hour. Note also that the median falls from $6.66 to almost zero as a result of the price decline. At $1.50 per pound, half the part-time trips would generate less than $3.00 per hour in potential net crew wages and at $1 per pound nearly half the trips would be effectively negative potential net returns per hour.

Table 4.41: Potential Returns: Dollar Per Hour Price Sensitivity

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	92	92	84	84	72
	average	25.79	22.56	19.32	16.08	12.85	9.61
	stddev	28.74	26.01	23.43	21.05	18.97	17.27
	median	15.56	12.44	9.67	7.83	6.00	3.41
	max	127.81	112.19	96.56	80.94	69.63	69.00
	min	-2.03	-2.67	-3.31	-3.95	-4.59	-5.24
Estimated Average Annual Return		49,899	43,638	37,378	31,117	24,856	18,595
Part-time	**percent**	78	74	74	63	63	52
	average	10.65	8.92	7.19	5.47	3.74	2.01
	stddev	14.97	13.68	12.45	11.31	10.27	9.37
	median	6.66	5.88	4.45	3.00	1.44	0.11
	max	51.39	48.26	45.14	42.01	38.89	35.76
	min	-5.57	-5.76	-5.96	-7.00	-8.25	-10.75
Estimated Average Annual Return		7,440	6,232	5,024	3,816	2,608	1,400

Source: Intercept Interview Data

The changes in estimated average annual returns due to a price change are shown in table 4.41. At the high-end price of $2.25 per pound, full-time vessels reported potential average annual returns of nearly $50,000, while part-time vessels have potential average annual returns of slightly less than $7,500 per year. When the price is $1.50 per pound, which was observed in roadside sales during the study, potential average annual returns fall by nearly forty percent for full-time vessel crew and by nearly fifty percent for part-time crew.

Applying the actual sales percentages to the potential net returns per hour yields the statistics presented in table 4.42. Comparing these statistics to those of table 4.41 one can see the affect that actual sale vs. potential sale has on net returns per hour. Average actual net returns from full-time vessel trips ranges from $20.92 to $5.32 per hour at prices of $2.25 and $1.00 per pound

respectively. This represents a reduction of nearly twenty percent at the high end of the price scale and nearly fifty percent at the low end of the price scale.

Table 4.42: Actual Returns: Dollar Per Hour Price Sensitivity

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	88	88	80	80	64
	average	20.92	17.80	14.68	11.81	8.44	5.32
	stddev	25.53	22.44	19.37	16.55	13.26	10.26
	median	13.07	10.82	8.64	6.48	4.07	1.82
	max	113.75	99.69	85.63	72.69	57.50	43.44
	min	-3.47	-3.95	-4.43	-4.88	-5.40	-5.88
Estimated Average Annual Return		40,463	34,428	28,394	22,842	16,325	10,290
Part-time	**percent**	74	70	59	59	59	37
	average	7.09	5.68	4.27	2.97	1.44	0.03
	stddev	11.97	10.90	9.88	9.01	8.10	7.40
	median	5.10	4.07	2.96	1.94	0.92	-0.17
	max	34.61	30.76	28.58	26.56	24.20	22.01
	min	-8.88	-9.50	-10.13	-10.70	-11.38	-14.25
Estimated Average Annual Return		4,951	3,965	2,979	2,071	1,006	19

Source: Intercept Interview Data

The average actual returns per crew hour for part-time trips falls from $7.09 to $.03 due to the price change. These averages represent a thirty-three and ninety-six percent reduction respectively from the potential average net return per crew hour for part-time trips. The median statistics of actual returns per crew hour show similar patterns. Note also that the minimums, which indicate the greatest loss on a per hour basis among the trips, have increased considerably in the actual returns data.

Estimated actual average annual returns are also shown in table 4.42. Using actual returns data has significantly reduced the estimates of annual crew returns to labor but it has also made the estimates more price sensitive. The drop in price from $2.25 to $1.50 results in a forty-five percent decrease annual returns for full-time crew and a fifty-eight percent decrease for part-time crew when actual returns numbers are used.

4.4.1.5. Impact of Investment Cost Recovery

A majority of respondents indicated that they utilize a crew share system that splits net revenue from the trip equally among the crew. However, the intercept interviews did not detect any share system that compensates the owner for his investment in the vessel and equipment. It was also not clear how trips with negative returns are apportioned to crew. It is likely that the owner bears the burden of expenses for trips with negative returns and owners may add trip losses to expenses of the next trip to recover their costs. The specific mechanisms used are not transparent. It is also not clear whether the interview questions were simply not sufficient to elicit adequate information on owner and operator shares and/or cost recovery methods.

It seems that some analysis is needed to determine what effect an additional share for the vessel owner would have on crew wages. This has been done in two ways. The first is to simply add another crewmember to the number on board and re-calculate the actual and potential returns to

crew hours. This method is referred to as the boat share method. The second is to calculate a seven percent rate of return on the owners investment and apportion it on a per trip basis as a quasi fixed cost. The per trip amount of this net return is then included in estimation of net returns per trip thereby affecting potential and actual net returns per hour. These two estimations are presented in tables 4.43 through 4.46.

The boat share method was chosen because share arrangements on commercial fishing vessels often include a share for the owner and/or the boat. The seven- percent rate of return method was chosen because vessel owners could reasonably expect to earn at least a seven percent annualized rate of return on the money they have invested in their boat and equipment if it were invested in an interest bearing account. In other words, the seven percent rate of return represents an opportunity cost of their current investment in boat and equipment.

By comparing the statistics of table 4.43 with those of 4.41 it is immediately obvious that average potential net returns per hour for full-time vessels falls considerably when a boat share is added. Full-time trip average potential returns per hour fall by over $10 when prices are $2.25 per pound and by a little more than $4 when prices are $1 per pound. The result is that average potential net returns per crew hour ranges from $15.45 down to $5.39 as pelagic price per pound falls from $2.25 to $1.00. The estimated annual returns mimic this drop. The associated median statistics are also considerably lower. Note that the minimum observation is actually smaller in absolute value when a boat share is added. This is because the additional boat share spreads both profit and loss among more shares resulting in lower averages and maximums but also smaller losses per crew hour.

Table 4.43: Potential Returns Per Hour Price Sensitivity: Boat Share Cost Recovery

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	92	92	84	84	72
	average	15.45	13.44	11.42	9.41	7.40	5.39
	stddev	15.14	13.65	12.25	10.95	9.80	8.87
	median	10.83	8.98	7.25	5.88	3.95	1.71
	max	63.91	56.09	48.28	40.47	34.81	34.50
	min	-1.52	-2.00	-2.48	-2.96	-3.45	-3.93
Estimated Average Annual Return		29,884	25,992	22,100	18,209	14,317	10,425
Part-time	**percent**	78	74	74	63	63	52
	average	7.07	5.90	4.74	3.57	2.41	1.25
	stddev	10.04	9.18	8.37	7.61	6.92	6.32
	median	4.44	3.92	2.96	2.00	0.96	0.07
	max	34.26	32.18	30.09	28.01	25.93	23.84
	min	-4.18	-4.32	-4.47	-4.67	-5.50	-7.17
Estimated Average Annual Return		4,936	4,122	3,309	2,496	1,683	870

Source: Intercept Interview Data

The statistics presented in table 4.43 for the part-time subgroup show a similar effect of adding a boat share. However, the impact is not quite as dramatic as for the full-time subgroup. This is because full-time trips average fewer crew on board than part-time trips. Thus, on average, an additional crew share will be a greater percentage increase in shares for full-time trips than for part-time trips.

Applying actual sales to the price sensitivity analysis including a boat share provides statistics on actual net returns per hour under the assumption that the owner retains a share of net revenue as a return on investment. In this analysis, full-time trip average actual net return per hour ranges from $12.92 down to $3.20 as price declines to $1 per pound. The associated median ranges from $8.71 down to $1.21. When price falls to $1.50 per pound, the median indicates that half of the full-time trips would result in wages of less than $4.33 per hour. The impact on part-time vessel trips is more profound.

The part-time average actual net returns per hour now ranges from $4.66 down to $-.09 over the price range. The associated medians show that half of the part-time trips generate actual net revenues that are less than $3.40 per hour when prices are $2.25 per pound. When prices fall to $1 per pound over half the part-time trips would have generated negative actual returns per hour. As is the case with the full-time subgroup, some trips are still fairly profitable on a per hour basis as is evidenced by the maximum statistics, which range from $23.07 to $14.68 as the price declines.

Table 4.44: Actual Returns Per Hour Price Sensitivity: Boat Share Cost Recovery

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	88	88	80	80	64
	average	12.92	10.98	9.03	7.25	5.15	3.20
	stddev	14.10	12.42	10.74	9.20	7.40	5.76
	median	8.71	7.21	5.71	4.33	2.86	1.21
	max	56.88	49.84	42.81	36.34	28.75	21.72
	min	-2.60	-2.96	-3.33	-3.66	-4.05	-4.41
Estimated Average Annual Return		24,995	21,236	17,476	14,017	9,957	6,197
Part-time	**percent**	74	70	59	59	59	37
	average	4.66	3.71	2.76	1.89	0.86	-0.09
	stddev	8.06	7.35	6.68	6.10	5.49	5.02
	median	3.40	2.81	2.22	1.46	0.61	-0.11
	max	23.07	20.51	19.05	17.71	16.13	14.68
	min	-5.92	-6.33	-6.75	-7.13	-7.58	-9.50
Estimated Average Annual Return		3,256	2,593	1,930	1,320	603	-60

Source: Intercept Interview Data

Tables 4.45 and 4.46 present statistics from the seven-percent investment cost recovery analysis. The result of the analysis is somewhat startling when compared to the previous analyses. One can clearly see that average potential net revenue per hour for full-time vessel trips is nearly as large as that reported without cost recovery. In other words, investment opportunity cost recovery has very little impact on average potential net returns per hour for full-time vessel trips. This condition generally holds true for part-time vessel trips. However, the impact of the investment opportunity cost recovery on part-time trips is slightly greater than for full-time vessel trips. This is likely due to the fact that part-time vessels averaged fewer trips per year than full-time vessels and had higher fixed costs. Full-time vessels spread these costs over more trips so the impact of the cost recovery is greater on a per trip and per hour basis for part-time vessels than for full-time vessels.

Table 4.45: Potential Returns Per Hour Price Sensitivity: 7% Investment Cost Recovery

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	96	92	92	84	80	72
	average	25.37	22.14	18.90	15.67	12.43	9.19
	stddev	28.59	25.86	23.28	20.91	18.83	17.15
	median	14.66	11.69	9.44	7.61	5.77	2.62
	max	126.91	111.28	95.66	80.03	69.00	68.37
	min	-2.30	-2.94	-3.58	-4.22	-4.86	-5.50
Estimated Average Annual Return		49,088	42,827	36,566	30,306	24,045	17,784
Part-time	**percent**	78	74	63	63	59	48
	average	9.19	7.46	5.73	4.00	2.27	0.54
	stddev	15.74	14.50	13.32	12.22	11.23	10.38
	median	6.35	4.81	3.74	2.39	0.88	-0.44
	max	50.97	47.85	44.72	41.60	38.47	35.35
	min	-13.00	-14.25	-15.50	-16.75	-18.00	-19.25
Estimated Average Annual Return		6,419	5,212	4,004	2,796	1,588	380

Source: Intercept Interview Data

Table 4.46 presents the investment opportunity cost recovery analysis using actual returns. The statistics shown are again quite similar to those shown in the actual net return price sensitivity analysis when a boat share is not included

Table 4.46: Actual Returns Per Hour Price Sensitivity: 7% Investment Cost Recovery

Subgroup	Statistic	2.25/lb	2.00/lb	1.75/lb	1.5/lb	1.25/lb	1.00/lb
Full-time	**percent**	92	88	84	08	76	64
	average	20.50	17.38	14.26	11.39	8.02	4.90
	stddev	25.40	22.32	19.25	16.43	13.15	10.15
	median	12.80	10.55	8.32	6.20	3.80	1.55
	max	112.85	98.78	84.72	71.78	56.60	42.53
	min	-3.74	-4.22	-4.70	-5.14	-5.66	-6.14
Estimated Average Annual Return		39,651	33,617	27,582	22,031	15,513	9,479
Part-time	**percent**	74	59	59	59	56	37
	average	5.63	4.22	2.80	1.50	-0.02	-1.43
	stddev	12.94	11.91	10.95	10.13	9.27	8.61
	median	4.68	3.70	2.58	1.56	0.30	-0.75
	max	33.54	30.35	28.16	26.15	23.79	21.60
	min	-18.62	-19.25	-19.87	-20.45	-21.12	-21.75
Estimated Average Annual Return		3,931	2,945	1,959	1,051	-15	-1001

Source: Intercept Interview Data

4.4.1.6. Income Characteristics

Information on several categories of vessel operator income was collected in the intercept interviews. Operators were asked to indicate their total annual household income level from a range of levels. In addition, operators were asked whether they have other jobs, income from other jobs, and whether they are receiving retirement income. Responses to questions on total household income per year ranged from a low of $5,000 to a high of $100,000 in the full-time subgroup and from $15,000 to $100,000 in the part-time subgroup. Average part-time operator total household income was $36,786 and was slightly higher than the $31,538 of full-time operators. Greater difference is seen in the median statistics for the two subgroups. The median for part-time operators of $35,000 is $10,000 more than the median for full-time operators.

In addition to having a higher average and median household income than full-time operators, fifty-seven percent of part-time operators also have income from other employment and fourteen percent have retirement income. None of the full-time operators reported having job or retirement income other than fishing income. The average job related annual income of part-time operators was $28,500 and the median income was $28,000. The fourteen percent of part-time operators who earned retirement income earned an average of $23,500 annually.

Vessel operators were asked to provide their estimate of annual gross sales as well as the percent of their income that comes from fishing income. Table 4.47 provides statistics on these items. Note that only thirty-eight percent of full-time and sixty-four percent of part-time operators were either able or willing to provide a gross sales estimate. The remainder may not have known their annual gross sales or reported not knowing because they were unwilling to provide the estimate.

Comparing the estimated actual average annual return per person presented in table 4.46 with the average household income derived from interview data shows an interesting finding. The average annual household income reported by full-time fishermen was $31,538, which is only slightly lower than the estimated actual average annual return per person of $32,249 shown in table 4.40.

Table 4.47: Income Characteristics of Vessel Operators

Subgroup	Statistic	Household Income	Other Employment Income	Percent of Income From fishing	Retirement Income	Gross Sales
Full-time	**percent**	100	0	100	0	38
	average	31,538	0	88	0	43,000
	stddev	24,443		23		10,954
	median	25,000		100		50,000
	max	100,000		100		50,000
	min	5,000		50		25,000
					Estimated Average Annual Gross Sales	**89,562**
Part-time	**percent**	100	57	71	14	64
	average	36,786	28,500	29	23,500	13,333
	stddev	21,448	8,569	28	4,950	8,078
	median	35,000	28,000	23	23,500	10,000
	max	100,000	44,000	100	27,000	30,000
	min	15,000	17,000	3	20,000	4,000
					Estimated Average Annual Gross Sales	**15,036**

Source: Intercept Interview Data

Thus, for full-time fishermen, the estimated actual return based on harvest, sales and costs data is quite similar to their own reported level of household income. At first glance it may seem that this doesn't hold true for part-time fishermen given that their reported household income averaged $36,786 but their estimated actual average annual return per person from fishing was only $4,364. However, fifty-seven percent of part-time fishermen reported income from other sources that averaged $28,500 per year and an additional fourteen percent reported retirement income averaging $23,500 per year. Adding these average to the estimate of average fishing income give a combined total of fishing and non-fishing income of $32,864 per year for those part-time fishermen who reported other income and $27,864 per year for those with retirement income. Thus, the part-time household income average is not inconsistent with estimated fishing income for the part-time subgroup.

An interesting difference between the part-time and full-time operators was their ability to provide estimates of their percentage of income that came from fishing. All full-time operators were able to answer the question and only three indicated a number other than one hundred percent. That is why the median for this subgroup is one hundred but the average is only eighty-seven and one half percent. In contrast, only seventy-one percent of part-time operators provided a percent of income response. On average, the percent of income from fishing earned by part-time operators was slightly less than thirty percent.

Table 4.47 provides estimated average annual gross sales calculated from interview data, which is simply average per trip sales multiplied by average number of trips per year for each subgroup. These estimates are derived for comparison with the estimate of gross revenue reported by those fishermen who were able to make the estimate. A review of these numbers shows that an obvious difference exists between full-time and part-time operators. The sixty-four percent of part-time operators that provided an estimate of annual gross revenue estimated an average of $13,333. This number is similar to the estimated average annual gross sales of $15,036 derived from interview data. However, estimates of annual gross revenue provided by the thirty-eight percent of full-time operators who provided those estimates averaged only $43,000 as compared to the $89,562 estimated from interview data. Thus, it appears that either full-time operators are not aware of their gross revenues or that they may have overestimated either their harvests or number of trips per year.

Recall that per trip harvest estimates as well as per trip revenue estimates derived from interview data are in general agreement with estimates reported by the Western Pacific Regional Fisheries Management Council using CNMI-DFW dealer invoice system data. However, the estimates of trips taken are much higher using interview data then when CNMI-DFW data are used.

4.4.1.7. Opportunity Cost of Labor

The previous analysis has established the returns to labor within the CNMI pelagic fishery. The next question is whether those returns are comparable to wages fishermen might earn in alternative professions. Unfortunately it was not feasible to conduct detailed questioning of crewmembers during the intercept interview. Thus, it is difficult to say what their potential other employment opportunities might be. Further, it is difficult to equate their considerable fishing experience with a level of experience required in other employment opportunities. This makes it difficult to say what wage they might be able to earn in their next best employment opportunity. However, fifty-seven percent of part-time fishermen reported that they had income other than fishing income. Statistics on their income from sources other than fishing are presented in table 4.47 above. The average annual income reported by these fifty-seven percent of part-time fishermen was $28,500 per annum or $13.70 per hour based on a fifty-two week year of 40 work

hours per week. It has also been determined that the average education and experience levels for full and part-time crew are very similar. Thus, this analysis will use the part-time "other income" wage as a proxy opportunity wage with the understanding that it may be an overestimate of the wage that full-time crew might be able to earn if they sought employment other than fishing.

Hourly and annual wages based on data collected in the intercept interview have been presented previously and can be compared to wages prevalent in the local economy as well as the proxy opportunity wage derived from part-time fishermen. Table 4.48 presents these wage estimates. The estimated annualized wages for full and part-time fishermen are calculated using estimated average actual earnings per trip multiplied by average trips per month for the subgroup and then multiplied by 12 months to calculate the annual estimate. The estimate for annual wage using minimum wage assumes fifty-two weeks at forty hours per week. The calculation for Northern Marianas College (NMC) annual wage uses the same fifty-two week and forty hours per week assumption. The wage rate and annualized wage listed for part-time commercial other income is the average wage that the fifty-seven percent of part-time commercial fishermen reported earning as other income.

Table 4.48: Comparison of Wage Rates ($).

Wage Category	Hourly Wage	Annualized Wage
Full-time Commercial	16.67	32,249
Part-time Commercial	6.25	4,364
Part-time Commercial Other Income	13.70	28,500
CNMI Minimum Wage	3.05	6,344
Northern Marianas College	10.75	22,362

Source: Intercept Interview Data and Northern Marianas College Human Resources Office.

The wage shows that full-time commercial fishermen earn an average wage that is, for their education level, comparable to wages paid by the local government and NMC. Further, the full-time fishing wage is about three dollars per hour higher than the wage part-time fishermen reported earning from other income. The average wage earned by full-time pelagic fishermen is also larger than entry level wages at the Northern Marianas College.

Part-time fishermen earn much less per hour than full-time fishermen and only about half of the "other income" wage that some part-time fishermen reported earning. However, part-time pelagic fishing earns about twice as much per hour as the minimum wage in the CNMI. Of course, the annualized estimate of part-time fishing wages is less than that of the minimum wage because the minimum wage estimate assumed full-time employment at that wage. The part-time pelagic wage is also lower than the Northern Marianas College entry-level wages.

4.4.2. Problems Encountered

One problem observed with this analysis was that fishermen had difficulty answering income and operating revenue questions. It appears that very few fishermen keep any kind of fishing records or even vessel logbooks. Given these circumstances, it is likely that many fishermen do not have good knowledge of their actual returns to their labor from the fishing enterprise.

Another difficulty with this analysis was that it was difficult to establish opportunity wages without detailed per-crew interviews. The interview utilized in this study was quite detailed and it does not appear that individual crewmember interviews at dockside would have been feasible. Thus, much is not known about the characteristics of crewmember participation in the fishery.

4.4.3. Conclusions and Recommendations for Additional Work

One of the objectives of this study was to determine whether there are significant labor constraints affecting the pelagic fishery of the CNMI. While it is true that commercial fishing entails a certain amount of risk and difficulty and income can vary significantly from trip to trip the analysis presented above indicates that the current fishery is generally profitable for the full-time vessels that were intercepted. However, the fishery is considerably less profitable for part-time vessels. Still, a majority of trips taken by both subgroups resulted in positive net returns. In addition, participation rates in the fishery appear to be lower than in times past. This suggests that there are other fishermen not currently participating that could enter the fishery if economic conditions warrant such entry. The existing fishery is not very demanding with regard to crew knowledge so virtually anyone of sufficient physical capability could participate. Since the CNMI currently controls its own labor and immigration, guest workers from the Philippines or other countries can also be brought in to crew on fishing vessels.

In all, it does not appear that there is a significant labor constraint in the current pelagic fishery. Rather, it appears that there is idle capacity in both vessels and crew that are not currently participating. The non-participation of these factors of production is more likely due to currently high operating cost and saturated markets that may have forced marginal producers to stop fishing either temporarily or permanently.

It is important to differentiate between the labor needs of the current small boat pelagic troll fishery and more advanced fishing methods such as longline. The longline fishery utilizes larger vessels, much more advanced equipment and gear, and requires significantly more crew training than a trolling fishery. During focus group meetings and dockside discussions fishermen were asked whether they knew how longline fishing works. A few fishermen had a vague idea but none could describe the method or the gear used. Thus, the fishermen currently participating in the pelagic troll fishery of the CNMI would need significantly training to participate in a longline fishery. Alternatively, trained guest worker crew could be brought in to take the place of local fishermen. However, the general lack of knowledge and training exhibited in local pelagic fishermen can be considered a constraint for developing more advanced fisheries such as a longline fishery.

Although it has been mentioned previously, it will serve for emphasis to again point out that in the long term interest of fisheries management, it would be beneficial for the local management authorities to have knowledge of who is and has been participating in the fishery. This could be accomplished by requiring a commercial crew members license in order to register participants. Such a license requirement could meet the need of providing contact information for participants so that they could be more easily made aware of important developments such as public hearings and fishermen's meetings.

Similarly, it would be helpful for long-term fisheries management to have accurate records on the vessels that have participated and who their operators have been. Such information would serve to show vessel and operator tenure in the fisheries and would provide an historical record of past and current participation. This information could also be used in formulating participatory approaches to fisheries management by inviting participants to be members of advisory panels.

4.5. MARKET CONSTRAINTS

An objective of this study is to evaluate local market conditions and determine whether local markets are constrained. This is done by first reviewing the findings of a previous study of seafood markets as well as available data on market size before proceeding with presentation of the results of this study.

4.5.1. Overview of the Analysis of Saipan's Seafood Markets

The "Analysis of Saipan's Seafood Markets" was conducted in 1993 and the final report was issued in 1995(Radtke and Davis, 1995). The analysis used market survey responses to estimate the total value of seafood market demand for Saipan. The analysis compared this estimated market demand with estimated landings derived from CNMI-DFW data. Their conclusion in 1995 was that total market demand for types of seafood that are caught locally is nearly $1 million in excess of local harvests. Their comparison is shown in table 4.49 below.

Table 4.49: Comparison of Projected Market Demand with Landed Value

Species Type	Reported Harvest value by Year (from CNMI DFW Data) ($)			Seafood Market Demand ($)
	1992	1993	1994	
Reef Fish	273,130	316,000	409,000	738,000
Bottom Fish	21,000	37,000	53,000	243,000
Pelagic Fish	306,000	249,000	206,000	683,000
Total	614,000	623,000	689,000	1,664,000

Source: Radtke, Hans, and Shannon Davis. 1995.

The Radtke and Davis analysis predicted a value of $683,000 annually for pelagic fish. This is more than double the CNMI-DFW reported value of locally landed pelagic fish from 1992 and more than triple the value from 1994.

Table 4.50: Commercial Pelagic Landings, Revenues, and Price in 1998

Species	Pounds	Revenue ($)	Average Price ($/lb)
Miscellaneous Tunas	2,213	4,629	2.09
Skipjack Tuna	133,819	267,718	2.00
Yellowfin Tuna	11,656	25,559	2.19
Subtotal above tuna's	**147,688**	**297,906**	**2.09**
Dogtooth Tuna	14,426	34,775	2.41
Mahimahi	20,529	44,413	2.16
Marlin	3,361	5,968	1.78
Sailfish	83	168	2.02
Wahoo	5,039	11,632	2.31
Subtotal Other PPMUS	**43,438**	**96,956**	**2.14**
Troll Fish	740	1,521	2.06
Barracuda	99	197	1.99
Rainbow Runner	603	1,507	2.50
Subtotal misc. pelagics	**1,442**	**3,225**	**2.18**
Total Pelagics	**192,568**	**398,087**	**2.13**

Source: Western Pacific Regional Fisheries Management Council 1999

Table 4.50 shows that the value of commercial pelagic landings within the CNMI in 1998 was just under $400,000(WPRFMC, 1999). However, the 1998 average price recorded by CNMI-DFW was $2.13 per pound, which is considerably higher than the average price of $1.71 Radtke and Davis used in their evaluation of market demand. The 1998 landings evaluated at $1.71 per pound would yield about $330,000 in annual pelagic revenues. Thus, CNMI-DFW landings estimates for 1998 still appear to only represent about half the total market demand for pelagic species that was estimated by Radtke and Davis.

The Analysis of Saipan's Seafood Markets provides data on the source of purchases by market sector. The results of that analysis are recreated in table 4.51. What is most interesting is that the retail sector is the largest market for local fresh fish. Thirty percent of the retail market sales are derived from locally caught fresh fish while none of the wholesale sales are derived from local catch. This is not surprising given that there are no buyer/processors operating in the CNMI other than retail markets.

Table 4.51: Source of Purchases (percent of source)

Type of Business	Local Fresh Fish	Imported Fresh Fish	Imported by Ship	Other
Wholesaler	0	15	85	0
Retail Markets	30	13	53	4
Resort Hotels	10	8	70	12
Restaurants	21	41	37	0
All Respondents	15	14	66	5

Source: Radtke, Hans, and Shannon Davis, 1995

Table 4.51 also shows that resort hotels and restaurants obtain only ten and twenty-one percent respectively of their seafood from local catch. Imports by ship were the largest source category for all sectors except restaurants, which obtain forty-one percent of the seafood they sell from imports of fresh fish. Thus, there is significant import market competition both from fresh and frozen or canned product forms and all market sectors are willing and able to substitute imported fish for locally caught fish.

The Analysis of Saipan's Seafood Markets provides a breakdown of the species composition of locally caught seafood by each market sector. Table 4.52 provides that breakdown, which shows that locally caught pelagic fish is a considerable portion of the purchases.

Table 4.52: Species Groupings of Local Fresh Fish Purchases (percent of species type)

Type of Business	Pelagic	Bottom	Reef
Wholesaler	0	0	0
Retail Markets	42	9	49
Resort Hotels	38	34	28
Restaurants	52	3	45
All Respondents	45	14	41

Source: Radtke, Hans, and Shannon Davis. "Analysis of Saipan's Seafood Markets."

However, local reef fish dominates retail market sales with forty-nine percent of the total coming from that species type. Resort hotel sales of locally caught fish are much more evenly spread among the species types. Restaurants that purchase locally caught fish purchase a majority of pelagic fish, few bottom fish and the remaining forty-five percent are from the reef fish species type.

Economists use a mathematical tool called price elasticity to describe the sensitivity of market demand to changes in price. The coefficient of price elasticity is the ratio of the percentage change in quantity demanded caused by the price change and the percentage change in price. Normally, when price increases quantity demanded for a product falls. Since the coefficient of price elasticity is a measure of this change it is usually negative for market demand.

If the coefficient of price elasticity is equal to negative one it means that the change in quantity will equal the change in price in percentage terms. If the coefficient is greater than negative one it means that quantity demanded will decrease by more than the increase in price in percentage terms. If the coefficient is less than negative one it means that the percentage change in quantity will be less than the percentage change in price. Also, the coefficient of elasticity can equal zero, which means that there will be no change in quantity for a given change in price. If substitutes goods are readily available then price elasticity will be higher (greater than negative one) than if there are no substitutes. This is important for seafood demand in the CNMI because imports are readily available.

In their Analysis of Saipan's Seafood Markets, Radtke and Davis gathered data from market survey respondents on their expected sales volume and price changes due to a ten, twenty, thirty, and fifty percent change in the price they have to pay for fresh fish. The responses were tabulated to derive sector level average price and volume changes and elasticity indicators. The results of that tabulation are presented in table 4.53.

Table 4.53: Effect of Fresh Pelagic Price Changes on Market Demand

Sector	Purchase price change	Sales Price Change	Sales Volume Change	Price Elasticity
All Segments	10%	6%	-1%	-0.17
	20%	16%	-12%	-0.75
	30%	31%	-36%	-1.16
	50%	50%	-71%	-1.42
Wholesale	10%	12%	0%	0
	20%	20%	0%	0
	30%	30%	-35%	-1.16
	50%	50%	-100%	-2
Retail	10%	9%	-4%	-0.44
	20%	22%	-20%	-0.91
	30%	34%	-50%	-1.47
	50%	56%	-73%	-1.30
Hotels	10%	3%	0%	0
	20%	14%	-16%	-1.14
	30%	35%	-34%	-0.97
	50%	50%	-90%	-1.80
Restaurants	10%	0%	0%	0
	20%	12%	-5%	-0.42
	30%	20%	-10%	-0.52
	50%	23%	-20%	-0.86

Source: Radtke and Davis, 1995. "Analysis of Saipan's Seafood Markets, 1995."

Radtke and Davis reported an average pelagic price of $1.71 per pound during their study in 1993. CNMI-DFW price data show that prices rose to a peak of $2.20 per pound in 1997 and

were $2.02 per pound in 1998(WPRFMC, 1999). The average price observed during this study was approximately $2 per pound. In percentage terms, the change in prices from 1993 to 1998 levels represents an eighteen-percent increase in the Purchase Price Change category shown in table 4.53. For ease of explanation the twenty- percent change shown in the table can be assumed to be equal to the change from 1993 to 1998. The peak price of $2.20 per pound in 1997 represents a thirty-three percent increase over 1993 priced. The thirty-percent change shown in the table will suffice to describe the effect of peak prices on retail sales price and volume.

When all sectors are considered together, seafood price is inelastic (less than negative one) until price rises thirty percent or more. This means that small price changes have little effect on volume when all sectors are considered together. At a ten percent price change all sectors except the retail sector show zero elasticity meaning that they do not change their sales price or volume. For hotels and restaurants this is likely because they have menu needs and standard buffet items as well as set prices that are not easily changed so they will absorb small cost increases. Wholesale establishments appear to have even less elasticity, as they will not change sales price or volume even if their purchase price for seafood increased by twenty percent.

When the purchase price for seafood begins to rise significantly, most establishments reported increased price elasticity. Radtke and Davis state that " Retail markets are the most important buyers of fresh local fish" (Radtke and Davis, 1995, pg VI-23). Thus, the focus here will be on the effect of price changes on the retail market sector. Local pelagic prices have risen nearly twenty percent since the market study calculated the elasticity estimates. As shown in table 4.53, retail establishments reported that if their purchase price for seafood increased by that amount they would raise price by an average of twenty-two percent and their consumers would purchase twenty percent less seafood. A thirty percent increase in the retail sectors cost of fish would result in a thirty-four percent increase in retail prices and a fifty percent decline in sales volume.

Clearly, the retail market, which is the most important market for locally caught fresh fish exhibits significant price sensitivity. Sales volume can be cut in half if prices rise to their peak levels of $2.20 per pound. It is important to keep in mind that price elasticity estimates assume that the only change is a change in price and other things, such as consumer income, remain constant. However, consumer income within the local population may have fallen during the economic slowdown of the late 1990's. Thus, it is possible that the quantity demanded by local residents for locally caught fresh fish has fallen due to the price increases and changes in consumer income.

The Analysis of Saipan's Seafood Markets found that the following market conditions prevailed in the CNMI.

- *"According to the study survey respondents, island residents, especially the indigenous Chamorro/Carolinians, were their most significant customers. This is especially true for retail establishments."*

- *Retail markets are the most important markets for local catch.*

- *"For resort hotels and restaurants, Japanese tourists are their most important customers."*

- *"Respondents listed price, freshness, and quality as being the most important components of customer preferences for seafood. If local fresh fish is not available, most establishments will import fresh fish to meet the demands of their customers."*

From these statements one can draw several conclusions about the composition of market demand for seafood. First, the local fresh pelagic market demand is likely composed of two primary sectors. One is local residents that utilize retail establishments as points of purchase and a second sector is the tourist market served by local hotels and restaurants.

A change in the second sector appears to have emerged since the Analysis of Saipan's Seafood Markets was conducted. A significant number of Korean buyers have begun to frequent the Sugar Dock ramp to purchase fresh skipjack for restaurants. These buyers have been observed to aggressively compete to purchase the freshest fish from the first boats that come in.

It is important to understand that the behavior of Korean buyers does not necessarily indicate increased demand for skipjack tuna. Discussions with the buyers revealed that they compete aggressively because they cannot be sure that enough fish will be caught to meet their daily needs. In fact, it was observed during this study that dockside buyer purchasing behavior is highly dependent on perceived supply. If several boats come in at the same time and appear to have good catches the buyers will not be so aggressive in their behavior. Several fishermen reported that under such circumstances the buyers will try to lower the price and buy enough fish to meet their needs for several days. Given that buyers indicate their behavior is due to perceived short supply and that dockside prices were observed to be sensitive to quantity supplied it is not safe to conclude that the emergence of Korean buyers at dockside represents increased demand but rather reactions to short supply.

Other conclusions that can be drawn from the Analysis of Saipan's Seafood Markets is that resort hotel operators and restaurants cater primarily to Japanese tourists. Also, price, quality, and freshness are critically important and import substitution is practiced by most establishments if the local fishery cannot meet their price, quality, and freshness needs.

4.5.2. Local Pelagic Market Scale

The Western Pacific Regional Fisheries Management Council has used CNMI Division of Fish and Wildlife dealer invoicing system data to report catch, effort, landings, and revenue statistics from 1983 through 1998. These data are presented in table 4.54 and provide an indication of the size of the local pelagic market. There appears to be a cyclical pattern to the fishery landings that is related to prices. In the early 1990's, prices, landing, and revenues were steadily increasing. Landings and revenue peaked in 1992. However, in 1993, prices fell and there was an eleven and eighteen percent decline in landings and revenues respectively.

Price fell slightly again in 1994 before beginning a steady rise and eventually peaking at $2.20 per pound in 1997, which was also the peak of the local economic boom. During that price rise, pelagic landings rose from 117,668 lbs. to a peak of 224,962 lbs. in 1996. Oddly, landings fell in 1997 even though prices peaked in that year. A potential reason for the decline in landings was a substantial decrease in trips taken in 1997 even though participation rates remained high (see section 4.4). 1998 landings increased by about ten percent. However, the nearly ten percent average price decline of 1998 offset much of the landings increase so total revenue only increased by about five percent.

The data in table 4.54 also show an interesting trend in harvest rates. The total landings of all pelagic species are under 200,000 lbs. in most years. However, there were four years during the 1980's when total pelagic landings were over 200,000 lbs. and in each of those years total

skipjack tuna landings were in excess of 200,000 lbs. During the 90's, there was only one year, 1996, when total landings exceeded 200,000lbs. In that year, skipjack landings were only 132,155lbs, or fifty-nine percent of the total pelagic catch. What is also apparent in the data is that annual skipjack landings in every year of 1983-89 exceeded skipjack landings in every year of the 90's.

At first glance, the trend in landings is surprising because the number of trips taken in the 90's exceed those of the 80's (see section 4.4). One might expect harvests to rise with effort levels. However, the economic conditions in the CNMI and their effect on market demand may be having an interesting effect on the relationship between effort and harvest that could be independent of fish stocks. While trips totals were at all time highs in the late 90's that data does not indicate the length of the trips or why trips were ended. Data from the intercept interviews conducted for this study suggests that market constraints are the prime determinant in trip length and timing. Further discussion of that data is presented in section 4.5.3.3 below. It is possible that market weakness may have a lot to do with the decline in harvests seen in the 90's.

Table 4.54: Pelagic Landings, and Tuna Share of Landings and Revenue, 1983-1998.

Year	Skipjack Tuna	Yellow-fin Tuna	Skip-jack %	Yellow-fin %	Subtotal tunas	Total Pelagic	Prices	Pelagic Revenue
1983	146,729	17,025	75	9	163,754	196,788	0.99	198,710
1984	232,675	15,664	85	6	248,339	272,909	0.95	264,203
1985	141,910	9,973	76	5	151,882	187,378	1.02	195,372
1986	203,490	13,533	83	6	217,023	245,907	1.07	267,013
1987	129,203	8,363	79	5	137,566	164,055	1.14	190,150
1988	213,198	12,300	80	5	225,498	267,619	1.20	327,260
1989	206,162	8,087	90	4	214,249	229,427	1.29	299,142
1990	118,798	8,374	82	6	127,172	144,862	1.56	235,520
1991	92,642	10,433	61	7	103,078	150,915	1.80	271,030
1992	65,982	20,672	41	13	86,654	162,691	1.91	305,927
1993	77,832	11,919	54	8	89,751	145,115	1.78	249,136
1994	73,769	10,600	63	9	84,369	117,668	1.75	207,124
1995	105,423	16,824	66	10	122,247	160,540	1.80	289,740
1996	132,155	30,410	59	14	162,656	224,962	1.89	431,560
1997	106,757	17,121	61	10	123,878	174,914	2.20	379,620
1998	133,819	11,656	69	6	145,475	192,568	2.02	398,086
Av.	**136,284**	**13,935**	**70**	**8**	**150,219**	**189,899**	**1.52**	**281,086**

Source: Western Pacific Regional Fisheries Management Council 1999

4.5.3. Accomplishments and Findings

The finding from the Radtke and Davis study suggest that the local pelagic market has considerable excess capacity into which the fishery might expand. However, the findings of this study call that suggestion into question.

Table 4.55 presents annualized estimates of pelagic harvest based on only the twenty-seven commercial vessels intercepted. It is not know what proportion of total commercial pelagic harvests these vessels represent. Annual pelagic harvest can be estimated from intercept interview data in two ways. Vessel operators were asked to estimate their monthly pounds of pelagic catch. The average monthly pelagic harvest reported by full-time vessels was 3,254 lbs. Part-time vessels reported average monthly harvests of 659 lbs. of pelagic fish.

Table 4.55: Estimated Annual Pelagic Harvests and Revenues

Subgroup	Annualized monthly harvests	Annualized per trip harvests	Estimated Annual lbs. sold	Estimated Annual Revenue	Annual Revenue adjusted to 1993 prices
Full-time	507,600	614,517	588,031	$1,164,302	$1,005,533
Part-time	110,640	136,545	106,314	$210,502	$181,767
Total	618,240	751,062	694,345	$1,374,804	$1,187,300

Source: Intercept Interview Data

Multiplication of these averages by the number of respondents in each subgroup provides total reported monthly harvest. Multiplication of that total by twelve provides an estimate of annualized harvest. As shown in table 4.55 full-time vessels reported harvesting 507,600 pounds of pelagic fish annually, while part-time vessels accounted for another 110,640 pounds. Based on monthly harvest estimates, the annual pelagic harvest is 618,240 pounds. This figure is more than three times the 1998 annual pelagic harvest estimated from CNMI-DFW dealer invoice data.

Another way to estimate annual harvest is to use average per trip catch rates annualized to a total harvest. This is a potentially more accurate method because there is less potential for recall bias in trip data than in monthly estimates. Using this method entails multiplying average per trip pelagic harvest by average number of trips per month to get average monthly harvest per vessels. Multiplication of this number by the number of respondents in the subgroup and then by twelve estimates a total annual pelagic harvest. Table 4.55 provides the result of this estimate as annualized per trip harvests. The per-trip estimates are slightly larger than those made using monthly totals. The total annualized harvest of the pelagic vessels intercepted as derived from trip level data is 751,062 pounds.

This analysis can be taken one step further by estimating the revenues that these total harvests would generate. Table 4.55 also provides the results of that analysis. The annualized per trip harvests are multiplied by the average percent of pelagic fish reported as actually sold for each subgroup to derive an estimate of annual pounds sold. The annual pounds sold estimate is then multiplied by the average price, which was $1.98 per pound for both subgroups. The result is that these twenty-seven vessels reported harvests, activity levels, and sales percentages that equate to total sales of more than $1.3 million annually, which is more than three times the annual revenue estimate derived from CNMI-DFW data (WPRFMC, 1999).

The revenues have also been adjusted to 1993 prices for comparability with the total demand estimate made by Radtke and Davis. The resulting revenue estimate of $1.2 million is nearly double the estimated total pelagic demand found in the Analysis of Saipan's Seafood Markets. This is quite surprising given that the local economy is in much worse condition now than it was when Radtke and Davis conducted their study.

4.5.3.1. Local Pelagic Market Structure

The intercept interview collected data on market channels used by pelagic commercial fishing operations. Table 4.56 shows the percentages of fishing operations that reported using each market channel as well as the percentage that used each market channel exclusively. The percentage of respondents that used each channel as their most frequent selling point is also shown. Since respondents could indicate use of multiple market channels the percentages do not necessarily sum to one hundred percent for any category.

Table 4.56: Usage of Market Channels by Pelagic Vessels (%)

Subgroup	Statistic	Retail	Restaurant	Road-side	Friends/ neighbors	Dock-side
Full-time	**Percent using channel**	46	15	31	0	46
	Exclusive channel	23	0	23	0	31
	Most frequent channel	23	8	23	0	46
Part-time	**Percent using channel**	43	21	14	21	50
	Exclusive channel	21	0	7	0	43
	Most frequent channel	36	0	14	0	50

Source: Intercept Interview Data

Dockside sales were used exclusively by thirty-one percent of full-time fishermen. Twenty-three percent of full-time fishermen used each of roadside and retail markets exclusively. Among part-time fishermen, forty-three percent relied on dockside sales exclusively. Seven percent of part-time fishermen relied on roadside sales exclusively, while another twenty one percent relied on retail markets exclusively. In total, seventy-one percent of part-time and seventy-seven percent of full-time fishermen use one market channel exclusively.

Table 4.56 shows that forty-six percent of all full-time fishermen, including those who used the channel exclusively, reported using retail markets to sell fish. The same percentage reported using dockside market channels. This trend holds true with part-time fishermen. Fifty percent of part-time fishermen reported selling at dockside and forty-three percent reported using retail markets. Clearly, dockside and retail market sales are currently utilized the most.

Thirty-one percent of full-time and fourteen percent of part-time fishermen reported using roadside marketing to sell fish. Fifteen percent and twenty-one percent of full and part-time fishermen respectively reported selling to restaurants. Interestingly, twenty-one percent of part-time fishermen reported selling fish to friends and neighbors but none of the full-time fishermen do so.

The data shows that dockside sales are the most frequently used marketing channel by both full and part-time fishermen. Forty-six percent of full-time and fifty percent of part-time fishermen reported that dockside sales were their most frequently used selling point. Retail and roadside sales channels are the next most frequently used. Thirty-six percent of part-time fishermen reporting using retail markets most frequently. Fourteen percent of part-time fishermen reported using roadside sales most frequently and none reported that restaurants or friends and neighbors were their most frequently used marketing channel. Eight percent of full-time fishermen reported that restaurant sales are their most frequent marketing channel but none reported friends and neighbors as a most frequently used channel.

4.5.3.2. Price formation

In the intercept interview, fishermen were asked to provide their expected ex-vessel price for their catch. Table 4.57 presents statistics on price expectations for pelagic, bottomfish, and reef fish. It is important to understand that the prices for bottomfish and reef fish were gathered from only those fishermen with catches of these species types. Since none of the full-time pelagic fishermen reported harvests of reef fish no price expectation was recorded. The price expectation for reef fish for part-time fishermen represents a single observation.

Pelagic price expectations for the full-time subgroup averaged just under $2 per pound throughout the study and ranged from a minimum of $1.50 per pound to a maximum of $2.75 per pound during the study. The median of $2 per pound indicates that half of the price expectations recorded were between $2 and 2.75 and half were between $1.5 and $2. Statistics for the part-time subgroup are nearly identical. The major difference is that the range for part-time fishermen is from $1 to $2.50 per pound, which is considerably lower than the range statistics for the full-time subgroup.

The few bottomfish price expectations recorded from full-time fishermen were all $3 per pound. Thus, bottomfish prices appeared to be constant for that subgroup. However, the part-time subgroup did report some variability with the price range extending from as low as $1.50 per pound to as high as $3 per pound. The average bottomfish price for part-time fishermen was $2.60 per pound and is a forty cents per pound lower than the full-time subgroup's average price expectations for bottomfish. Interestingly, the median of $3 per pound equals the maximum and indicates that at least half of the part-time fishermen expected this price. However, half of the part-time fishermen expected prices between $1.50 and $3.00. The only observation for reef fish was a price of $2.50 per pound.

Table 4.57: Price Expectations

Subgroup	Statistic	Pelagic	Bottomfish	Reef Fish
Full-time	**average**	1.98	3.00	N/A
	stddev	0.36	0.00	
	median	2.00	3.00	
	max	2.75	3.00	
	min	1.50	3.00	
Part-time	**average**	1.98	2.60	2.50
	stddev	0.37	0.65	
	median	2.00	3.00	
	max	2.50	3.00	
	min	1.00	1.50	

Source: Intercept Interview Data

The intercept interview also gave vessel operators the opportunity to describe how their price expectation is formed. Table 4.58 presents the percentages of responses in each category for full and part-time vessel operators. The methods listed were compiled from actual responses from fishermen not from a pre-formed list. Twenty-three percent of full-time and forty-three percent of part-time fishermen reported that they base the price they ask on recent dock price. Another twenty-three percent of full-time and twenty-nine percent of part-time fishermen reported that they use recent dock price but adjust their price for sales volume. Thus, nearly half of the full-time and nearly three-quarters of the part-time fishermen rely on dockside prices. However, over half of those fishermen reported that sales volume affects their price.

Thirty-one percent of full-time fishermen reported that they set the price at their own roadside markets but only seven percent of part-time fishermen did so. Another fifteen-percent of full-time and seven percent of part-time fishermen indicated that they take the price that is set by a retail store. Eight percent of full-time and fourteen percent of part-time fishermen indicated that they set their own price and do not lower it. The small percentage of full-time fishermen reporting that they will not lower their price indicates that most full-time fishermen prefer to sell all their catch in an evening in order to be ready to go out the next day.

Table 4.58: Price Formation Methods (% responses)

Method	Full-time	Part-time
recent dock price	23	43
recent dock price adjusted for catch volume	23	29
set price at own roadside market or store	31	7
price set by store	15	7
sets own price and won't lower it.	8	14

Source: Intercept Interview Data

4.5.3.3. Market Saturation and Instability

Table 4.59 includes seven reasons given by fishermen for ending their trips. The "slow" reason indicates that the trip was ended because fishing was not very good. Trips ended to "meet the market" were ended to get the fish either to dockside, roadside, or fish market by the end of the workday in order to meet daily consumer after-work demand. If a trip was ended due to a "sell constraint" the fisherman felt that he would have difficulty selling any more fish than he had already caught. A trip ended due to a "capacity constraint" indicates that the fisherman felt he had caught all his boat could carry. "First to market" indicates that the fishermen stopped fishing so that he could come in early in the afternoon to try to beat other boats to the dock. Some trips were also ended due to "darkness" or because the fisherman didn't have enough ice ("need ice") on board to keep the fish cold. Note that not all reasons had positive responses for both subgroups.

Table 4.59: Reason For Ending Trip (% of responses)

reason	Full-time	Part-time
slow fishing	8	31
meet market	46	31
event	0	4
sell constraint	15	26
capacity constraint	0	4
first to market	15	4
darkness	12	0
need ice	4	0

Source: Intercept Interview Data

Several differences in behavior between the two subgroups are evident. The Part-time fishermen reported ending thirty-one percent of their trips due to slow fishing. In other words, nearly a third of all part-time trips are ended due to difficulty catching fish. In contrast, only eight percent of full-time trips were ended due to slow fishing. This suggests that there may be significant differences in the ability to catch fish between the two subgroups. Another difference is that none of the part-time trips were reportedly ended due to darkness, however, twelve percent of the full-time trips were ended due to darkness. Similarly, none of the part-time trips were ended due to lack of ice but four percent of full-time trips ended due to needing more ice. Part-time fishermen also reported ending trips in order to attend some family or community event but full-time fishermen did not.

The most frequently reported reason for ending trips was to meet the day end market time. Forty-six percent of full-time trips and thirty-one percent of part-time trips were ended in order to meet the market. This is a significant finding in that it means that the timing of the market is the single

greatest determinant in trip length. Full-time fishermen also reported that they stopped fishing on fifteen percent of their trips because they had caught all the fish they thought they could sell. Another fifteen percent of full-time trips were ended early to try to be first to market.

The impact of market limitations was even greater on part-time trips. Part-time trips were ended due to the sell constraint twenty-six percent of the time. However, only four percent of part-time trips were ended to be first to market. All combined, seventy-one percent of full-time trips and sixty-one percent of part-time trips were ended to either meet the daily market, due to the sell constraint, or due to trying to be first to market. Thus, the market timing, size, and daily catch volume clearly dictate fishermen's trip length and harvest. It appears from these findings that fishermen could harvest greater quantities if the market were sufficient to support greater harvests. During focus meetings, several fishermen indicated that this was so.

During the intercept interview fishermen were asked whether they were able to sell all their catch. If they responded that they couldn't, they were also asked why they couldn't. The responses to these two questions are tabulated in Table 4.60.

The statements made by fishermen are paraphrased in the table. "Sells all" indicates that the fisherman reported that they sell all their catch. Only fifteen percent of full-time and seven percent of part-time fishermen indicated that they could sell all their catch. This is strong evidence that the current pelagics market is saturated and weak.

Table 4.60: Market Sales Conditions:

Statement	Full-time	Part-time
sells All	15	7
sells all if they lower price	46	0
low price/eat or give away	23	36
low price/must freeze and sell frozen	8	22
market glutted by first boats in/give away	8	21
low price/refuse to sell	0	14

Source: Intercept Interview Data

"Sells all if they lower price" indicates that fishermen must lower their price to sell all the fish they catch. Forty-six percent of full-time fishermen reported that they could only sell all of their catch if they lower their price. In sharp contrast, none of the part-time fishermen reported that they lower their price to sell their fish. This difference is a significant finding with regard to the sales motivations of the two subgroups. Nearly half of full-time fishermen appear to be willing to lower prices to sell their fish but part-time fishermen will not do so.

"Low price/eat or give away" indicates that if the price is too low they will not sell the fish and will eat it themselves or give it away to friends and family. While none of the part-time fishermen indicated that they would lower their price in order to sell all their fish, thirty-six percent said that they would eat the fish or give it away if prices are too low. Twenty-three percent of full-time fishermen indicated that they too would rather eat the fish or give it away rather than lower their price to sell it all. Thus, it appears that some fishermen try to exert some market power by refusing to sell fish if their price does not meet their expectations. These refusals to sell fish in order to eat it or give it away likely result in the cost of the trip being a loss. The greater willingness of part-time fishermen to refuse to sell fish is possibly because many of them have other sources of income. In contrast, none of the full-time fishermen interviewed had other job related income and may not be as willing to "eat" the cost of a trip.

"Low price/must freeze and sell frozen" means that if the price is too low, the fishermen would rather freeze the catch and sell it frozen. Only eight percent of full-time fishermen indicated that they would do this but twenty-two percent of part-time fishermen reported freezing catch if they couldn't sell it all. Unlike part-time fishermen, many full-time fishermen take trips nearly every day and cannot take time to try to sell fish the next day, especially lower value frozen fish.

"Market glutted by first boats in/give away" indicates that fishermen will give catch away if the market has been glutted and they cannot sell all their fish. Eight percent of full-time fishermen and twenty-three percent of part-time fishermen reported giving catch away if the market is glutted. Finally, low price/refuse to sell indicates that fishermen simply won't sell if the price is too low. Presumably, they will eat the fish and/or give it away to friends and family. None of the full-time fishermen reported refusing to sell any fish if the price were too low. However, fourteen percent of part-time fishermen indicated that they wouldn't sell anything if the price is too low.

4.5.3.4. Potential Local Market Erosion

The willingness of fishermen to give fish away is interesting in another way. Recall from the discussion of market sales conditions and the data from table 4.60 that twenty-three percent of full-time fishermen and thirty-six percent of part-time fishermen intercepted indicated that they would rather eat or give away fish if the price is too low. The question is who are they giving fish away to? Daily catches often far exceed what even the large families that are culturally traditional in the CNMI can consume before spoilage sets in. Freezing the fish is rather expensive given the high cost of electricity. Thus, it seems likely that when fish is not sold due to low prices, much of it ends up being given away to friends and extended family members.

The Analysis of Saipan's Seafood Markets found that the most important customers of retail establishments are the indigenous Chamorros and Carolinians (Radtke and Davis, 1995). In other words, the friends and family members of the fishermen who likely receive fish that is given away are also the most important customers of the retail establishments. It has been demonstrated above that retail establishments are an important marketing channel for local pelagic catch. It is also clear from the findings presented above that the market exhibits significant volume and price sensitivity. Thus, it is quite possible that the apparently common practice of giving catch away when prices are low may have further negative effect on prices by reducing the quantity demanded of those indigenous consumers who receive fish for free. People who frequently receive fish for free may also cultivate an expectation that they will continue to receive fish for free and may be unwilling to buy fish. Several fishermen actually mentioned this situation during focus discussions at dockside.

Since the primary consumer of locally caught pelagic fish are indigenous peoples, the practice of giving fish away may indeed erode market demand and reduce market prices. One must bear in mind, however, that giving fish away is a culturally significant tradition that may represent barter rather than a strict give away. Such transactions have considerable economic and social value. The fact remains, however that giving one's product away for free to one's primary market is bound to have an effect on prices and quantities demanded by those who make up that market. Thus, the common practice of giving fish away may be causing considerable market erosion.

4.5.3.5. Fresh Pelagics Import Market Situation

Japanese, Taiwanese, and American Longline vessels routinely deliver high quality bigeye and yellowfin tuna to fish buyers at the port of Guam. These vessels fish under access permits in the waters of the Federated States of Micronesia and on the high seas. They deliver in Guam due to

the daily direct air transport routes to Japan and because of the well developed fishing infrastructure and fishing vessel services available in Guam (see section 4.6). The vessels begin to offload their cargo around sunset so as to minimize any warming of the fish. The fish have been bled, gilled, gutted, and bagged at sea before being immersed in refrigerated salt brine in the vessel hold where they are chilled to near freezing. (Personal observation at dockside). The fish are immediately graded at and the highest grades are boxed with gel ice packs and loaded into airline shipping containers, which are delivered to the airport for transport on an early morning flight.

The determination of what grade of fish will be air shipped is dependent on the market price in Japan. If the price for a particular grade is not sufficient to justify air shipping that grade and all grades below it will be processed into loins by the buyer and sold in the local Guam market or transshipped to processing facilities elsewhere. These loins and whole fish are also exported to the CNMI. The landing, processing, and local sale of these tuna is currently completely legal under Guam regulations (pers. comm Harris, 2000.).

Although the loined tuna product that results from this operation is technically "off grade" it is still of very high quality. Guam buyers indicated that loined tuna that is sold locally or transshipped to Saipan is often quite high quality but not necessarily the top sashimi grade. However, calling it "off grade" does not seem quite appropriate given that it has been extremely well handled both at sea and at the processing site. One CNMI restaurant operator described the tuna loins they are getting from Guam as "just beautiful." That restaurant operator also indicated that they have no problem with supply. "We just make a phone call and we have what we need the next day" was how the restaurant owner described the supply consistency.

The quality of fish imported from Guam raises the issue of whether local fishermen can provide fish at that quality level. Data from the intercept interviews shows that the vessels used in the local pelagic fishery are small and have limited holding capacity usually consisting of plastic coolers. None of the vessels intercepted had any form of onboard refrigeration or the space to install such systems. In addition, the daily expenditures for ice averaged just $12.50 and $8.06 for full-time and part-time fishermen respectively. This is only about 10 bags of ice for the entire trip. This is a very small amount of ice to properly cool the average catch for an entire day at sea in 80-90 degree temperatures. In addition, not one commercial fisherman interviewed indicated that they bleed their fish when they are caught. None of the commercial fishermen reported using a sea water and ice slush mixture to rapidly cool their fish. The few who had heard of this technique recognized that it is superior to simply using freshwater ice. However, they indicated that it melted their ice too quickly to get through the entire day. Thus, it appears that the local pelagic boats are not doing enough to properly handle and chill their fish. This problem was identified in the market surveys conducted by Radtke and Davis as well as was inconsistent supply by local vessels.

While quality and species preferences may be the driving factors in resort hotel demand, the price and form of the product are also important. None of the fishermen intercepted indicated that they do any kind of processing, such as loining. Thus, the price they receive is for the whole fish with a minimum of labor cost on the fisherman's part. The average price received during the study was reported to be about $2.00 per pound for fresh whole skipjack. Assuming fifty percent meat yield, which was verified by the PI, the price per pound of meat product is about $4.00 not including the cost of labor for processing.

Clearly the availability of fresh processed yellowfin tuna loins from Guam meets many of the criteria important to hotels and restaurants that cater to the Japanese. The fish is of high quality

and freshness, is preferred over skipjack, is pre-processed, and is consistently available from CNMI wholesalers who have made connections with the Guam buyers. The only other issue is whether the price of the yellowfin tuna available from Guam is competitive with locally caught skipjack tuna.

In September 1999, the Northern Marianas College Small Business Development Center conducted a telephone survey of purchasing managers from three local hotels four restaurants and three large retail grocery stores (Plinske, 1999). Each respondent was asked to describe the fresh fish they purchased and to provide the price per pound, monthly demand in pounds and vendor source for the product. The results of this survey show that only one restaurant purchases yellowfin tuna from local fishermen and all other respondents purchased yellowfin and bigeye tuna in either whole or loin form local wholesalers that obtain the fish from Guam. The price indicated by the respondents was $2.27 to $2.50 per pound for headed gilled and gutted (HGG) fish and $3.00 to $4.50 per pound for loins. The current price being quoted by several wholesalers is $3.50 per pound for loins (PI verified by purchase). On a per pound of meat product basis the wholesale prices of yellowfin loins imported from Guam are less then the price for locally caught unprocessed yellowfin and skipjack. In addition, the prices for headed, gilled, and gutted yellowfin imported from Guam are comparable to round prices for locally caught skipjack and yellowfin, which implies that the imported HGG fish are cheaper per pound of meat product than locally caught tuna.

The total monthly demand for yellowfin tuna by only these buyers was reported to be 7,410 pounds per month of which only 100 pounds was caught locally. This survey was not meant to be a comprehensive survey of the entire import demand for fresh yellowfin tuna. However, it does show that the total importation of fresh yellowfin tuna by only these buyers is nearly 90,000 lbs per year. The buyers indicated that they purchase the fish three to four times a week as needed, which is indicative of the consistent supply available via Guam. Clearly, the local fresh pelagic fishery faces stiff import competition from high quality yellowfin tuna imported from Guam. The product is competitively priced, available in a processed form, consistently available, and of extremely high quality. Thus, the local fresh pelagic market is very likely limited both in the price it can safely charge and by the availability of a higher quality product that resort hotels and restaurants will prefer in order to meet consumer preferences of their Japanese clientele.

4.5.3.6. Tinian Market Conditions

Tinian Fishermen face a different set of market conditions than those of Saipan. There are no dockside buyers in Tinian. Most fishermen intercepted in Tinian indicated that they either own their own store, sell door to door, or try to sell to the Tinian Dynasty Hotel and Casino, which reportedly buys locally caught fish for feeding their staff. Most fishermen reported that they can usually sell everything they catch if they go door to door but that sometimes the price is not very good. Tinian fishermen reported that they dislike selling to retail stores because of consignment type sales that retail stores offer.

Tinian fishermen can sell fish at the local Farmer and Fishermen's Market, which is run by the CNMI Department of Lands and Natural Resources. However, the market has reportedly been in operation for eight years but has never sold fish. The market manager indicated that the fishermen were unwilling to take a price cut to sell fish at the market and that the fishermen would rather sell door to door or to the Tinian Dynasty Hotel and Casino.

Discussions with the Tinian Dynasty Hotel and Casino staff yielded several key points that limit their purchases of locally caught fish. They indicated that the quality of locally caught fish is

good but the supply is not dependable. This is apparently because fishermen are not "in business." The Dynasty staff reported that they couldn't depend on local supply so they must import from Guam or other Asian sources or even from Saipan.

Retail market operators on Tinian also provided information on how they view the local market process. They indicated that selling fish in the retail stores is not that common on Tinian because locals and restaurants get fish directly from the fishermen. The stores do not have arrangements with fishermen and only get fish if the fishermen bring fish in to them. Retail stores recognize that the fishermen do not like the consignment sales method. However, they indicate that there is usually some spoilage so they won't buy the fish outright.

4.5.3.7. Rota Market Conditions

While market conditions on all three islands covered in this study can safely be described as constrained, the market conditions on Rota are extremely so. Only three intercepts were recorded in Rota during the study, however meetings with several fishermen were held. The primary comment made by Rota fishermen was that there was very little market demand and only two or three fishermen actively sell fish. The Rota Resort was reported to be an occasional buyer. However, their purchases are infrequent because they usually buy bigger fish to process and freeze for later consumption. Some fishermen try to sell door to door or from their house. The community is small enough that this appears to be a successful method, however, only one fishermen appeared to be attempting to operate as a full-time pelagic commercial fishermen. Other fishermen reported that they try not to cut into the market of this one full-time fisherman.

Retail market operators were asked to provide comments on the local commercial fishing market situation. Most reported that they could sell more fish but that fishermen don't want to take a price cut to sell at the store. They also report that the quality is good and that they encourage fishermen to deliver to them. One store reported that is has an arrangement with a fisherman but most do not. A general opinion of retail operators in Rota is that the local fishermen fish as a hobby not to make money.

4.5.4. Problems Encountered

No significant problems were encountered in the course of conducting the research for this section. Market operators were quite willing to answer questions and discuss their businesses. Fishermen intercepted were more than willing to answer questions regarding their marketing and they generally felt it was their single biggest challenge.

4.5.5. Conclusions and Recommendations

Clearly, CNMI pelagic fishing operations are considerably constrained by market conditions. Fishermen have difficulty selling all their catch and reported shortening their trips because of the constraint. The market weakness appears to be because the local small boat pelagic fleet relies on dockside restaurant buyers and the local indigenous people as their primary retail customers. It is likely that local indigenous people have experienced some loss of income due to the economic slowdown occurring in the CNMI and this may be negatively affecting their demand for fresh fish. Increased fish prices may also be negatively affecting quantity demanded as evidenced by the price elasticity findings of the "Analysis of Saipan's Seafood Markets." (Radtke and Davis, 1995) Local market weakness may be also be affected by the relatively common local practice of giving fish away to friends and family when all the fish cannot be sold.

Large resort hotels and many restaurants prefer to purchase fresh yellowfin tuna imported from Guam. Their preference is likely because the yellowfin available via Guam is of high quality, is pre-processed, holds longer than skipjack, and is competitively priced. Unfortunately, there does not appear to be any ready solutions to these market problems. It is doubtful that the existing local pelagic fleet can compete on quality, product form, preference, or even price bases with yellowfin imported from Guam. Further, exporting skipjack does not appear to be a viable alternative given the current glut in canned tuna inventories that has recently idled vessels and canneries and pushed cannery grade skipjack prices down to less then $.20 per pound (Casamar, 2000).

In all, it appears that expansion in the current local pelagic fishery will require an improvement in local market conditions via improvements in the economy of the CNMI. Unfortunately, the CNMI government can do little to change the economies of Asian countries. Until external forces bring about improved economic performance in the CNMI, the localized market that the current pelagic fishery depends on will not likely improve.

4.6. INFRASTRUCTURE CONSTRAINTS

On objective of this research was to determine whether local infrastructure is adequate to promote the development of pelagic fisheries in the CNMI. In making this determination it is necessary to review and evaluate facilities for their adequacy in supporting the existing fishery as well as their potential for supporting expanded operations. However, the extent to which these facilities are regionally cost competitive is of great importance when considering development potential. To assess regional cost competitiveness the facilities of the CNMI and their cost is compared with facilities available on nearby Guam.

4.6.1. Accomplishments and Findings

Available infrastructure has been reviewed to determine it's adequacy for promoting the development of pelagic fisheries in the CNMI. Included in this review are launch facilities, marinas, port facilities, processing facilities, as well as cost structures of these facilities.

4.6.1.1. Small Vessel Launch Facilities

Saipan:

The island of Saipan is currently served by three concrete boat ramps; one at the Smiling Cove Marina, one just south of Garapan at Garapan Fishing Base and one at Sugar Dock. These ramps serve a variety of users including commercial and recreational fishing vessels, commercial passenger vessels, and jetski operations.

Of the three existing ramps, the least utilized by trailered pelagic commercial fishing vessels is the Smiling Cove ramp. Fishermen report that the Smiling Cove ramp is difficult to use at low tide and farther away from the fishing grounds and selling locations than either of the other two ramps. Another reason why fishermen prefer to use the other ramps is that they are closer to the fishermen's homes, which minimizes transit time.

Of the remaining two ramps, Garapan fishing base ramp is the least preferred by commercial pelagic fishermen. The Garapan ramp is currently unusable at extreme low tides due to a drop-

off at the end of the ramp and a very gradual slope beyond the ramp. Vehicles were seen on several occasions having difficulty retrieving vessels at low tide at Garapan ramp. One benefit of the Garapan ramp is that is has the best parking of any ramp on Saipan.

Sugar dock ramp is the preferred ramp for local commercial fishermen. The ramp is adjacent to "Sugar Dock", which is a concrete pier belonging to the Commonwealth Ports Authority. Pelagic commercial fishing vessels pull up to the pier near the ramp and sell to buyers on a daily basis. Sugar Dock ramp does not have a drop off at the end of the ramp so vessels can be effectively retrieved at low tide. The ramp area was recently dredged by the CNMI-DFW in response to complaints from fishermen.

The popularity of Sugar Dock ramp is also a difficulty. Frequently, the narrow access road is clogged with parked vehicles and boat trailers and congestion can be a problem. In addition, jetski operators use the ramp daily and are often pulling their craft out of the water at the same time as fishermen wish to do so. While some fishermen expressed concerns about jetski's using the ramp at Sugar Dock, everyone appears to cooperate on ramp usage and no conflicts were observed.

Sugar Dock pier belongs to the Commonwealth Ports Authority (CPA), while the launch ramp is under the jurisdiction of the CNMI Division of Fish & Wildlife. It was recently reported that a ferry operation designed to carry cars to and from Tinian may be interested in leasing the facility.(Casas, 2000) If a lease were awarded it could worsen traffic congestion problems at Sugar Dock thereby having a negative impact on the ability of fish buyers to transact business with fishing vessels.

It is possible that use of the Sugar Dock area for a car ferry could provide a benefit to fishermen who use the area. There are adjacent lands at Sugar dock that could be acquired by CPA and developed to provide more parking. Doing so might reduce traffic congestion in the area. In addition, the dredging of the Sugar Dock channel and improvements in navigational aids that would be necessary to support a ferry operation could be a significant benefit to local fishermen who complain that the channel is not well marked or maintained.

Tinian:

Tinian is served by a single concrete boat ramp adjacent to the Tinian marina. The ramp was observed to suffer from low water and lack of slope beyond the end of the ramp, which made vessel retrieval difficult at low tides. This boat launch ramp was constructed by the U.S. Navy and is used to land amphibious landing craft and troops during military exercised on Tinian. Following Tandem Thrust '99, the Navy expressed interest in dredging the ramp area to facilitate future military training exercises. This would have a corresponding benefit to local fishermen (pers. comm Miller, 2001). There is also an unimproved ramp of sorts just north of the concrete ramp this is used by the Department of Public Safety for launching their patrol boat. Ample parking is also available at the Tinian ramp

Rota:

Rota is served by two concrete ramps in the Song Song village area. One ramp is located adjacent to the site of the planned new west harbor marina, which was dredged in 1999. The ramp is somewhat narrow and steep but appears to be usable at all tide stages. There is also ample parking nearby. The second ramp is located on east Sasanhaya bay and is primarily used by local dive operators.

4.6.1.2. Marinas

Saipan

Vessel moorage is in short supply in the CNMI. Marinas were constructed on each island by the CNMI Division of Fish and Wildlife during the 1980's. These marinas were constructed with funding assistance from the U.S. Fish and Wildlife Service's Federal Aid for Boating Access Program. On Saipan, a 63-slip marina is available in Smiling Cove. This marina has slips that can accommodate 20 vessels up to twenty feet in length, 20 vessels from twenty to thirty feet in length, 10 vessels from thirty to forty feet in length, 8 vessels from thirty-five to sixty feet in length, and 5 shallow draft slips for vessels up to thirty feet in length. The marina is well protected by a barrier island breakwater including ironwood trees for a windbreak, and as such it is the only typhoon-safe moorage in the CNMI. The docks consist of floating polyethylene sections moored to concrete piles with steel ramps connecting the docks to the adjacent parking area. The Smiling Cove Marina does not have power hookups for vessels. Water was recently supplied to the head of the dock ramps and locked security gates have been installed.

Occupants of the Smiling Cove marina include recreational fishing vessels, commercial fishing vessels, recreational sailing vessels, commercial passenger vessels and charter fishing vessels. In addition, marina management allows other vessels that do not occupy slips to moor between marina docks if there is a threat of a typhoon. There is currently a waiting list for space in Smiling Cove.

A second marina, called the Outer Cove Marina was constructed on Saipan in 1998. The marina is constructed of fixed concrete piers mounted on steel and concrete piling. The piers are considerably higher than the high water level and make boarding small boats difficult. The Outer Cove Marina has 6 sixty-foot berths, 6 fifty-foot berths, 2 forty-five foot berths, 2 thirty-foot berths, 2 twenty-eight foot berths, and 16 twenty-five foot berths. In addition, a large vessel mooring pier was built to provide 500 feet of moorage for large passenger vessels but also to provide a passenger load and unloading area for vessels not berthed at the Outer Cove. The Outer Cove Marina is also equipped with a fuel dock, water, a small convenience store, restrooms, a picnic area, and 24-hour security staff. Currently, there are vacancies in the Outer Cove Marina.

The outer cove Marina is fully exposed to weather from the North and does not currently have a breakwater. As a result, considerable wave action is frequently present in the marina when winds from the North and Northeast are experienced. These conditions have prompted some boat owners to claim that the marina is not safe. In a major typhoon event, commercial fishing vessels moored in the Outer Cove or at CPA facilities in the Port of Saipan would be at considerable risk. Many vessels seek refuge in Smiling Cove Marina during severe storms. However, access to Smiling Cove is restricted by a marina management plan and vessels intending to seek shelter there are required to register in advance with the marina manager. During Tropical Storm Somai (August 2000) the available space in Smiling Cove was fully utilized. Outer Cove Marina also suffers from the fact that the marina developer was not able to completely dredge the center of the marina. This has left behind a shallow water and debris area that limits maneuverability.

A significant limitation with both the Smiling Cove and Outer Cove marinas with regard to commercial fishing ventures is that neither facility is equipped with a dock or pier from which catch may be offloaded from vessels. Neither facility has any lifting equipment such as dock

cranes. Small mobile cranes or boom trucks cannot get close enough to vessels to be of use for offloading because there is no pier onto which they can safely drive. Thus, offloading of a commercial fishing vessel in these facilities, while not subject to Commonwealth Port Authority cargo tariffs, is a labor-intensive activity of physically carrying fish up the dock ramps. Clearly, these facilities would not support larger scale fisheries than the current small boat troll fisheries. CPA facilities would have to be used for offloading of large volumes of catch.

Tinian

A small marina of similar construction to Smiling Cove was also built on Tinian adjacent to the Port of Tinian piers. As a result of several severe storms in 1997, the marina was heavily damaged. The docks have deteriorated to the point of being dangerous and the ramp connecting the marina to shore is gone. The CMI-DFW is currently in the process of selecting a contractor to reconstruct the Tinian marina (pers. comm Miller, 2001). Currently, there are several commercial passenger vessels utilizing the marina docks. However, all of the commercial pelagic vessels intercepted in Tinian were trailered vessels and did not utilize the marina. This marina is inside the old breakwater that was constructed by the military in WWII. However the deteriorated state of this breakwater does not provide adequate protection to the marina during severe storm events.

Rota

A small marina was also constructed on Rota in West Harbor adjacent to the port facilities and boat ramp. The marina floats suffered considerable damage during typhoons in 1997. Several storms damaged the remaining floats in early 2000. What remains is a single float that was reportedly built by the Rota Mayor's Office with assistance from CPA. A complete re-construction of the Rota marina is now under way and will be discussed in section 4.6.1.3 below.

CNMI Moorage Fees

Mooring costs at the marinas are charged on a graduated scale by vessel length. Table 4.61 lists the rate charged by length for both commercial and recreational vessels. Both marinas require a deposit of two months moorage fees. In contrast, the marinas in Tinian and Rota have not charged moorage fees in the past.

Table 4.61: Saipan Marina Rates

Smiling Cove Marina		**Outer Cove Marina**	
Vessel length	**Fee**	**Vessel Length**	**Fee**
20.0-29.0	$3.50/ft	**20.0-29.0'**	$5.00/ft
29.1-44.0	$5.50/ft	**29.1' to 42.0'**	$7.00/ft
44.1 >	$8.00/ft	**42.1' to 52.0'**	$10.00/ft
		52.1' to 65.0'	$15.00/ft
		65.1' to 100'	$20.00/ft
Commercial	$8.00/ft	**Commercial**	Same as above
Temporary	$4/day	**Temporary**	Prorated

Source: Marine Revitalization Corporation Outer Cove Marina Berthing/Mooring Lease and CNMI Division of Fish and Wildlife, Smiling Cove Marina Office.

4.6.1.3. Marina and Boat Launch Development Plans

Saipan

The CNMI Division of Fish and Wildlife is currently planning several infrastructure development projects. The Sugar Dock boat ramp area was recently dredged to remove the sand that has accreted there. The dredging is intended to improve the ramp and vessel offloading areas along the Sugar Dock pier. In addition, the Division of Fish and Wildlife is preparing to install two additional boat ramps. One will be located in Tanapag village north of the Port of Saipan and another will be located across from the Division of Fish and Wildlife offices in Lower Base. The lower base ramp will be used by the Division for research and enforcement vessels and will also be available for use by fishermen. It is not clear whether either of the new ramps are likely to benefit commercial pelagic vessel operators as they are further away from the fishing grounds than existing ramps. The Tanapag ramp may have potential as a new dockside sales location given that it will be in the heart of Tanapag village.

Tinian:

The CNNI Division of Fish and Wildlife is planning to replace the dilapidated floats at the Tinian marina and install a new ramp to the docks. The project is in the early stages and The CNMI-DFW is currently in the process of selecting a contractor to conduct this work. The project is not expected to be completed until 2002.

Rota

The CNMI Division of Fish and Wildlife is preparing for the installation of a completely new marina in Rota's West Harbor to replace the one damaged by typhoons. The area for the new marina has been dredged and the surveying for the facility in underway. The Rota Marina will be a floating dock system with four 48 foot berths, six 36 foot berths, and six 28 foot berths.(Windsor and Kelley, 2000.) In addition, the marina development plan indicates that the existing shoreline riprap directly fronting the floating dock facility will be reshaped to better dissipate wave energy when storms occur.

4.6.1.4. Port Facilities:

Saipan

The seaport of Saipan is under the jurisdiction of the Commonwealth Ports Authority (CPA) and has undergone extensive development during the 1990's. Dredging of the shipping channel and turning basin to a depth of 40 feet was officially certified in March of 1999. The shipping channel is 400 feet wide at the entrance to the harbor basin and is 10,000 feet long from the entrance to the turning basin. The turning basin itself is 1000 feet in diameter. The channel has a near 90-degree bend near its entrance and this area experiences potentially dangerous crossing currents. Pilotage is required for vessels in excess of 300 tons.

Filling and hardening of the port area and warehouse construction was also completed in 1999. The resulting facility, which is under the ownership and control of Saipan Stevedore Company, includes 38,600 square feet of warehouse space and 98,626 square feet of paved open storage.

The Main commercial dock provides 1,930 feet of moorage space with 40-foot depth on three docks. The largest of the three is the Baker Dock, which is 1,414 feet in length. Baker Dock is

equipped with fuel bunkering and receiving facilities at dockside as well as sewer discharge inlets and water outlets. There is also an underground cement offloading pipeline at Baker Dock.

Adjacent to Baker Dock is Charlie Dock, which consists of a frontage pier and interior pier. The frontage pier, (Charlie-1) is 516 feet long and the interior pier (Charlie-2) is 440 feet long. Charlie-1 is equipped with a water supply outlet and has a berthing depth of 40 feet. Charlie 2 has a berthing depth of 25 feet and is currently leased out to several ventures including the Tinian Express ferry and Saipan Crew Boats. There is also a short interior berth at the end of Charlie-2 called CPA-1, which is 170 feet long that is currently leased to commercial tour boat operators operating shallow draft vessels due to the 6 foot berthing depth. An additional area at the West end of Baker dock, known as Able dock provides 244 feet of berthing space that is currently occupied by a local tug and tow company.

Adjacent to the interior pier of Charlie Dock is the Delta Dock area. Delta dock is a finger pier that is currently leased to a private venture operating a charter fishing company as well as a dinner cruise vessel. At the end of Delta Dock is a Mobil Oil small vessel fuel dock. CPA has one additional dock adjacent to the CPA parking lot and east of Delta dock. This dock, called CPA-2 is 151 feet long and reportedly has a depth of 8 feet. Commercial fishing vessels have used this dock in the past for homeport mooring. However, the waters adjacent to the area are quite shallow and there is very little safe turning area so the size of vessels that can use this dock is restricted.

Cranes and heavy equipment are available through Saipan Stevedore Company. The largest is a 200-ton Hitachi crawler stick crane. Three additional mobile cranes are available; a Kato 160-ton and two Tadano cranes of 120 and 50 ton capacity. Additional heavy equipment is available including a fleet of forklifts ranging from 2.5 to 25 ton capacity.

The new port facility has expanded capabilities for containerized freight handling and is capable of supporting visits by various U.S. Navy Ships and cruise ships in addition to container ships. The primary usage of the port of Saipan is the handling of containerized consumer goods imported into the CNMI. The outgoing cargo currently consists of containerized garment sector exports. The peak usage of the port occurred in 1998 when 1,029,532 tons of cargoes were handled and 37,750 passengers passed through the port. In 1999, a ten percent drop in revenue tonnage was recorded (926,267 tons) although passengers more than doubled to 85,062 likely due to the improved port facilities that now support Naval vessels and cruise liners.

In addition to the seaport expansion, the Commonwealth Ports Authority has had a project underway for quite some time to improve the terminal facilities at the Saipan airport. The improvements have included enclosing and air conditioning arrival facilities and improvements to the immigration area. The runway facilities are currently capable of jumbo jet service and are underutilized. Airline utilization of the Saipan airport has fallen dramatically during the economic decline of the late 1990's due to the decrease in visitor arrivals. However, there are daily direct flights to Asia that offer cargo space for transshipment of high quality fish.

Tinian

The seaport of Tinian was originally developed by the Japanese to support the pre World War II sugar cane industry. The harbor was expanded considerably by the U.S. Military in late 1944 to implement a final phase of the Manhattan project. The facilities include a 2000-foot long north south quay (north quay) and two 600-foot long finger piers (A and B) connected by a main pier (west quay). The original facility was dredged to a depth of 30 feet; however, the depth in the

turning basin and quays is reportedly between 23 and 27 feet currently. The finger piers are constructed of steel sheet pile back-filled with coral and topped with concrete and asphalt. The finger piers have suffered severe deterioration of the sheet pile and collapse of their hardened surface. The Tinian Harbor Master Plan described the condition of the facility as follows

> *"the two finger piers (A and B) are generally considered unusable because they have deteriorated and partially collapsed. The west quay (main pier) is in a similar degraded condition and is basically unusable for heavy cargo loading or unloading. The North quay, about 2000 feet long is in better condition. The inner 1000 feet were repaired in 1979, an additional 250 feet were repaired in 1985, and the outer 750 feet are usable but in need of repair."*

A sheet pile and rubble breakwater was also built by the U.S. military. The breakwater is 4,805 feet in total length and is about 15 feet high. The breakwater consists of a 1,210-foot long inner breakwater that runs from shore to the 3,595-foot long outer breakwater. The inner breakwater was constructed of a single row of interlocking 1/2" steel sheet pile. The outer breakwater was constructed of 120 circular cells of thirty-foot diameter. These cells were also constructed of 1/2" steel sheet pile and then filled with coral rock and capped with a 10" thick poured concrete slab. The Tinian Harbor Master Plan describes the condition of the breakwater as follows

> *"Much of the sheet pile on the inner breakwater has deteriorated and collapsed leaving little protection for the harbor for the entire distance of 1,210 feet between the shore and the outer breakwater. … The inner facing sheet pile of the outer breakwater cells is badly deteriorated and much of the sheet pile has collapsed. This condition has caused much of the coral fill to wash out causing much of the minor shoaling in the turning basin and probably around the piers and quays themselves."*

Clearly, the physical facilities of the port of Tinian are deteriorating rapidly. The breakwater has deteriorated to the point of being nearly breached in several places. In addition, the steel sheet pile used to construct the piers has deteriorated and is breaking up in several places. Continued deterioration will occur if no action is taken to repair and maintain the facility.

The port of Tinian is served by Mobil Oil Company, which has constructed a facility adjacent to the main frontage pier. In addition, Tinian enjoys high quality water, which is available at the port. However, provisioning and vessel repair facilities are quite limited in Tinian.

The Tinian Express ferry service between Saipan and Tinian is the primary commercial use of the Tinian port facility at this time. The ferry makes multiple runs between Saipan and Tinian to support the Tinian Dynasty Hotel and Casino, which began to operate in the late 1990's. The facility is also used by the US military during large-scale maneuvers conducted on military leased land on Tinian. In addition, the facility is sometimes used to moor derelict or confiscated fishing and/or cargo vessels.

In the past, the port of Tinian hosted an active tuna transshipment operation. A large scale cold storage was built near the South end of the frontage pier in the 1980's and served a fleet of tuna catcher vessels operating in the western pacific. The cold storage facility was essentially a freeze and hold facility. Reefer motherships would dock at the facility to load and transship the tuna to canneries elsewhere. The facility fell into disuse in the early 1990's due to financial difficulties of its operator. Eventually the facility was transferred to the receivership of the U.S. National Marine Fisheries Service and put up for sale. However, the facility suffered considerable damage

to its roof during typhoons in 1997. As a result, several of the freezer boxes leak. The system had been maintained in operable condition by an onsite caretaker until the loss of power during the typhoons.

The refrigeration system has reportedly not been run since November of 1997. Inspection of the facility showed considerable standing water in the leaking freezer boxes and damage to at least a third of the sheet metal roof. However, the refrigeration compressors appeared to be in good condition and well maintained externally. In addition, the electrical components of the system were found to be in remarkably good condition given the years of exposure to the local climate. What is not known is whether any of the electrical system has suffered damage due either to water intrusion during the typhoons or from non-use since that time. What is also not known is the condition of the internal seals in the refrigeration compressors given that they have not been run since 1997. In addition, the caretaker was not aware of what specific type of refrigerant the facility was designed to use. If the system was designed to run on banned Chlorofluorocarbon (CFC) refrigerants it might have to be retrofitted to use a new Hydrofluorocarbon (HFC) refrigerant. Such retrofitting may involve replacement of seals, which could entail a rebuild of all of the freezer compressors. Thus, considerable work and expense may be involved in making the Tinian cold storage operational again.

Recent legal developments also affect the Tinian cold storage facility. In October of 2000, a pending labor case against the original operator of the facility resulting in the transfer of the facility from the receivership of the National Marine Fisheries Service to the control of the U.S. Marshall Service. The court ordered the U.S. Marshall to sell the facility in order to generate proceeds to settle the labor claims against the original owner. According to the U.S. Marshall's office in Saipan, the facility will be auctioned off sometime in 2001. (pers. comm. Jacot, 2000.)

Tinian Harbor Master Plan

In 1997, the Commonwealth Ports Authority (CPA) commissioned a study to develop a Tinian Harbor Master Plan. The study was conducted principally by Juan C. Tenorio and Associates, Inc. and details a complete redevelopment of the port facilities. Of particular interest for this study is the apparent focus of the redevelopment plan away from industrial use, such as commercial fishing, and toward supporting a tourism-based economy. The executive summary of the report provides a "Vision for Tinian Harbor." This vision makes the following statements

> *This is a resort, recreation, and general cargo port. It is not a heavy industrial port... Because the surrounding port land and pier and harbor areas are not large areas, the port does not have large land areas or well-suited sites for industrial activities (such as major ship repair or fish canneries). Also, because the planning objective for the Tinian Port is part of the visitor destination growth strategy for the island, heavy industrial land uses are better left to Saipan or other locations. To achieve this vision, the port must be kept neat, clean and well landscaped because of the numerous visitors who will pass through it. This implies a special responsibility with strong commitment to making Tinian Harbor and port lands a beautiful and attractive place to visit.*

Further evidence of the predisposition of the plan away from supporting commercial fishing activities is the specific statement made in the plan regarding commercial fishing. The statement reads as follows.

The master plan makes no special provision for commercial fishing vessels or commercial fish processing. During the 1980's, it looked like Tinian might become a major tuna transshipment port. However, facilities at Apra Harbor (Guam) have superseded this idea and today it is unlikely that Tinian could rationally compete with Apra.

Recently, inquiries were made regarding the feasibility of establishing facilities (about 75 acres) for a 350 vessel tuna fleet, possibly at Tinian. This would not be the best idea because of: a) the limited land and berth area available at Tinian for such a large venture; and b) the CPA and the CNMI have designated Tinian as a visitor destination and recreational harbor, not an industrial harbor; experience at Pohnpei has shown the tuna fishing industry to be a fickle business, subject to the vagaries of tuna schools which may change their locations annually, and also of the tuna markets which fluctuate widely depending on economic parameters.

The plan also mentions that numerous longline vessels utilized Tinian Harbor during the 1980's for cannery transshipment. The plan asserts that there were complaints of water pollution in the harbor and also because of airborne odors, although no reference for the source of this information is provided. These statements seems to confirm that CPA is not interested in developing Tinian Harbor to support commercial fishing activities either to compete with Apra Harbor Guam or to support localized longline operations. The plan does mention the cold storage and mentions interest expressed by a representative of a fishing company to utilize it and dock space for a tuna transshipment operation serving 150 longline vessels per month.

The focus of the plan on recreation and away from commercial fishing was apparent to reviewers of the plan. During a public hearing in Tinian a key area of comments that emerged was the following

"The master plan should not preclude tuna or fish transshipment if CPA determines that adequate land and pier space is available for this function."

The response given on this comment was as follows

"The master plan does not preclude this activity. It would be especially workable at the east end of the north quay and along the east quay, both locations are not useful for cargo and container handling because wave conditions. CPA and Tinian stated that such proposals should require a public hearing and review by the CNMI Coastal Resources Management Process.

Apparently the plan authors felt that commercial fishing vessels are not in need of protected and calm waters for off loading. The plan makes several major proposals for redevelopment of the Tinian Harbor facility. Each are highlighted below

- Reconstruction of the main breakwater, extension of a low elevation breakwater and construction of a revetted mole.
- Harbor dredging and provision of a 500 foot turning basin
- Repair and resurfacing of the east quay
- Removal of finger pier A to increase maneuvering room
- Replacement of the main pier and finger pier B with open pile structures to reduce wave action

- Construction of a new passenger ferry dock to the west of the current main dock and dredging of a 200 foot wide 15 foot deep access channel.
- A new small boat facility for 80 to 100 vessels ranging from 25 to 50+ feet in length.
- Removal of petroleum facilities to a safe distance from passenger facilities.
- Redevelopment of the commercial port facilities
- A vessel haul out facility to support a 125-ton travel lift primarily focused on support of the Tinian express ferries operated by Tinian Shipping Company.
- A vessel repair area
- A landing craft or barge ramp
- Small craft shops and a clubhouse
- Small craft launch ramp
- Picnicking and camping area
- Dredged thrill craft (jetski) area
- Visitor and Cultural Center

The plan proposes four phases of construction. Phase one would consist of breakwater reconstruction and was estimated to cost $25,476,000. Phase two consists of the passenger ferry and small craft and recreational facilities and was estimated to cost $20,700,240. Phase three is the development of the commercial port facilities and was estimated to cost $7,310,846. Finally, phase four consists of construction of a visitor and cultural center, which was estimated to cost $7,524,000. Thus, the plan proposes repairs and upgrades totaling $61,011,086 in estimated cost. However, funds have not been identified for the project at this time.

Tinian Airport

The Tinian Airport is currently only capable of small commuter air and air freight flights to and from Saipan and Guam. The facilities are not currently sufficient to support commercial jet aircraft. However, the Commonwealth Ports Authority recently began work on significant improvements to the Tinian Airport. The environmental assessment for the project was completed in early 1998. Land clearing for the project is set to begin in early 2001. The project will renovate an abandoned military runway adjacent to the existing Tinian Airport runway. The new runway will be 8,600 feet in length to support wide-bodied aircraft. The existing runway will become the taxiway. A new navigation system and runway lighting will be installed to support night operations. A completely new terminal facility will also be constructed. The new terminal will be a two-story facility with check-in counters for four airlines. It will also have a departure lounge that can accommodate up to 700 passengers, a restaurant/coffee shop, Customs and Immigration stations, a "duty free shop", auto rental vendor spaces, a VIP lounge, and passenger loading bridges. The building will have a total of 123,620 gross square feet of space. In addition, there will be 267 parking spaces in a new parking area (Tenorio and Associates, 1998).

Once completed, the expanded runway and airport facilities will be capable of supporting international commercial jet operations. The primary motivation for the expansion is to allow direct flights to and from Asia to support the Tinian Dynasty Hotel and Casino. However, the added benefit of these tourist-related flights will be cargo space that could be used to transship fresh sashimi grade tuna to market in Asia. Also possible will be direct cargo flights to transship sashimi grade tuna to markets all over Asia and the Pacific.

Rota

The Rota seaport is located in Rota's West Harbor. The facilities are currently limited to two 100' concrete frontage piers and a small turning basin. The harbor area is dredged to between 20 and 30 feet but the entrance to the harbor is quite narrow and not passable in rough sea conditions (pers comm.Taisican, 2000). One of the frontage piers is currently used for containerized freight transfer and is equipped with a mobile crane used for offloading containers. The other frontage pier is available for moorage and not currently in use.

The facilities at Rota are minimally capable of handling Rota's sea-freight needs. Only small ships and barges can be accommodated due to the physical size limitations of the harbor area. In addition, there is no breakwater other than the fringing reef on the North side of the harbor so storm conditions can cause surf to wash into the harbor area. Fuel is not readily available at the port as there is no fuel dock. However, fuel delivery can be arranged via local Mobil Oil vendors.

There are currently no ship repair services available for hire although fabrication services are available via local mechanic shops. Maritime operations needing such services would likely have to integrate such capabilities into their operations. Provisioning capability is quite limited and expensive compared to Saipan or Guam and there is virtually no commercial fishing gear available. In total, the facilities of Rota harbor are severely limited and not conducive to the development of any fishery other than a local small boat fishery based in the marina or utilizing trailered vessels.

Rota Seaport Upgrades

The port of Rota is in need of significant upgrades. Apparently some planning has gone into redeveloping the port facility. An artist's rendition of the proposed port hangs on the wall of the Rota Seaport office. However, copies of a formal plan were not available. From the drawing, one can see that the plan includes dredging to widen the shipping channel and turning basin to approximately twice its current dimension. The drawing also shows construction of a rock breakwater to protect the harbor from the North and Northeast. Improvements in the cargo area are also shown. These improvements would significantly improve the physical facilities available for small to medium sized cargo vessels as well as fishing vessels and would drastically improve protection from storms. However, funding is not currently available to undertake the project.

Rota Airport

The airport facilities on Rota have recently undergone some expansion. A large concrete tarmac was recently constructed adjacent to the terminal facility and existing tarmac. The Commonwealth Ports Authority also plans to re-seal and re-groove the runway surface to improve breaking ability for large aircraft. The $2.79 million project is expected to be completed by July of 2001 and may make it possible for Rota to be served by jet aircraft. Continental Micronesia used to serve Rota with Boeing 727 aircraft, however, they suspended their service some time ago reportedly due to lower breaking effectiveness (Saipan Tribune, 1-26-01).

4.6.1.5. Commonwealth Port Authority Moorage Facilities

The Commonwealth Port Authority also makes some of its facilities available for large vessel moorage. The port facilities in Tinian that are not being used for the Tinian express ferry, though in poor condition, are available for moorage and are currently underutilized. In addition, CPA makes several pieces of its property available for moorage in Saipan. The container port area in

Saipan can be used for short-term vessel moorage. CPA also leases space adjacent to the container port area to the Tinian Express ferry, Saipan Crewboats, and several commercial passenger and commercial charter fishing operations. The facilities adjacent to the container port at Charlie Dock are currently full to capacity.

In addition to Charlie Dock, CPA has leased space on Echo dock to a commercial passenger tour operator and to a commercial bottomfishing venture. The bottomfishing venture is a relatively new entrant to the fishery and leased the CPA land in order to construct a small cold storage facility for holding frozen bottomfish prior to shipment to Korea. The fishing venture used to occupy moorage at the Outer Cove Marina.

CPA has leased the area in the Saipan lagoon known as the Seaplane ramps. There are two ramps; the North and South ramps. The South ramp is utilized for moorage and business operations of local tour operators and a Saipan to Tinian freight hauler. The facility is also used as a haul out location for vessels needing maintenance and repair. The North ramp is used for moorage by another commercial bottom fishing venture and for vessel haul out and repair.

4.6.1.6. Wharfage Tariffs, Dockage Fees, and Port Fees:

Vessels docking at Commonwealth Port Authority facilities in Saipan are required to pay wharfage fees while unloading cargo. The current wharfage tariff rate is $4.25 per revenue ton of the cargo. However, cargo that is intended for transshipment is charged $1.08 per revenue ton. Note, however, that the CPA is proposing an amendment to the regulations that would raise these fees initially to $5.50 per revenue ton of cargo and $1.13 per revenue ton of transshipment in October of 2001. Additional increases are planned for 2002 and 2007.

Table 4.62: Wharfage Fees at the Port of Saipan and Planned Increases ($/revenue ton)

Fee Type	Effective Dates					
	04/01/95	04/01/97	07/01/99	10/01/01	10/01/02	10/01/07
Wharfage	2.71	3.25	4.25	5.50	5.75	6.00
Transshipment	1.08	1.08	1.08	1.13	1.19	1.25

Source: Commonwealth Port Authority. "Proposed Amendments To The Commonwealth Ports Authority Seaport Division Terminal Tariff." Commonwealth Register, vol. 21, no 4. April 19, 1999.

The Commonwealth Ports Authority also charges a port entry fee. The fee is charged on all vessels entering the commercial port or refueling within the territorial waters of the CNMI. The current fee is $81.00 for vessels that are 1,000 gross tons or less, and $161.00 for vessels greater than 1,000 gross tons but less than 2,000 gross tons. For vessels over 2,000 gross tons, the fee is $161.00 plus $81.00 for each additional 2,000 gross ton increment. These fees are also to be increased under the proposed tariff schedule as shown below.

Table 4.63: Port Entry Fees at the Port of Saipan and Planned Increases ($/RGT)

Fee Type	Effective Dates					
	04/01/95	04/01/97	07/01/99	10/01/01	10/01/02	10/01/07
Up to 1000 RGT	61.88	61.88	81.00	105.00	110.00	116.00
1000-2000 RGT	123.75	123.75	161.00	209.00	220.00	231.00
2000 + RGT	123.75+	123.75+	161.00+	209.00+	220.00+	231.00+

Source: Commonwealth Port Authority. "Proposed Amendments To The Commonwealth Ports Authority Seaport Division Terminal Tariff." Commonwealth Register, vol. 21, no 4. April 19, 1999

The Commonwealth Ports Authority also charges short-term dockage fees for vessels utilizing commercial port facilities for offloading cargo. The current rates are based on length of the vessel and are listed in the short-term dockage fees table below. These fees are charged on a daily basis. However, vessels that are homeported in the CNMI are eligible for a homeport dockage fee that is charged monthly and is discussed in the moorage section below.

Table 4.64: Short Term Dockage Fees at the Port of Saipan and Planned Increases ($)

Vessel LOA	Effective Dates					
	04/01/95	04/01/97	07/01/99	10/01/01	10/01/02	10/01/07
0-100	46.57	55.88	73.00	95.00	100.00	105.00
100-150	59.51	71.41	93.00	121.00	127.00	133.00
150-200	72.45	86.94	113.00	147.00	154.00	162.00
200-250	124.20	149.04	194.00	252.00	265.00	278.00
250-300	124.20	149.04	194.00	252.00	265.00	278.00
300-350	188.02	225.62	293.00	381.00	400.00	420.00
350-375	227.70	273.24	355.00	462.00	485.00	509.00
375-400	227.70	273.24	355.00	462.00	485.00	509.00
400-425	266.51	319.81	416.00	540.00	567.00	595.00
425-250	266.51	319.81	416.00	540.00	567.00	595.00
450-475	305.33	366.40	476.00	619.00	650.00	683.00
475-500	305.33	366.40	476.00	619.00	650.00	683.00
500-525	344.14	412.97	537.00	698.00	733.00	770.00
525-550	344.14	412.97	537.00	698.00	733.00	770.00
550 and over	486.45	583.74	759.00	986.00	1035.00	1087.00

Source: Commonwealth Port Authority. "Proposed Amendments To The Commonwealth Ports Authority Seaport Division Terminal Tariff." Commonwealth Register, vol. 21, no 4. April 19, 1999

The CPA is authorized to charge a surcharge of $300 per 24-hour period for vessels occupying commercial port space that are not engaged in cargo unloading. However, fishing catch vessels are specifically allowed to remain in port without surcharges while they are waiting to unload cargo, while unloading, and for a period not to exceed three days thereafter for purposes of reprovisioning. Further, fishing motherships must report to the Port Superintendent their proposed plan for loading and transshipment and are allowed to remain at dockside for a period not to exceed 10 days without surcharge provided that the Port Superintendent approves their plan.

The CPA also charges other miscellaneous charges for use of the port facilities. Fresh water, if available, is charged at $.30 per ton and $35 will be charged to connect and disconnect hoses except on Saturdays, Sundays, and Holidays when the fee is $80. CPA also charges for electricity at the CNMI government rate, which is currently $.13 per kilowatt-hour. A connection fee of $8 is charged if the vessel utilizes its own cables, plugs, or connectors. If the port uses its equipment to make connections the fee is $11 plus the necessary labor time at established man-hour rates.

4.6.1.7. Moorage Fees

In addition to the two marinas, it is sometimes possible to utilize Commonwealth Ports Authority facilities at Charlie Dock or the Seaplane Ramp in Saipan Harbor. The CPA tariff schedule specifies daily dockage fees for vessels offloading cargo. However, a home port dockage fee is

charged for vessel that operate on a continuing and long term basis in the waters of the CNMI. The rates vary by vessel length and harbor and are listed in the homeport fee table below.

Table 4.65: Homeport Fees at Ports of Saipan and Tinian and Planned Increases ($)

Vessel LOA	Effective Dates					
	04/01/95	04/01/97	07/01/99	10/01/01	10/01/02	10/01/07
0-25	27.00	27.00	35.00	45.00	47.00	49.00
25-75	45.00	45.00	58.00	75.00	78.00	82.00
75-100	135.00	135.00	175.00	227.00	238.00	250.00
100-150	180.00	180.00	234.00	304.00	319.00	335.00
150 and over	Daily fee	Daily fee	Daily fee	Daily fee	Daily fee	Daily fee

Source: Commonwealth Port Authority. "Proposed Amendments To The Commonwealth Ports Authority Seaport Division Terminal Tariff." Commonwealth Register, vol. 21, no 4. April 19, 1999

Table 4.66: Homeport Fees at The Rota Port and Planned Increases ($)

Vessel LOA	Effective Dates					
	04/01/95	04/01/97	07/01/99	10/01/01	10/01/02	10/01/07
0-10	6.00	6.00	8.00	10.00	11.00	12.00
10-12	8.40	8.40	11.00	14.00	15.00	16.00
12-14	10.80	10.80	14.00	18.00	19.00	20.00
14-16	13.20	13.20	17.00	22.00	23.00	24.00
16-18	18.00	18.00	23.00	30.00	31.00	33.00
18-20	21.60	21.60	28.00	36.00	38.00	40.00
20-22	24.00	24.00	31.00	40.00	42.00	44.00
22-24	26.40	26.40	34.00	44.00	46.00	48.00
24-26	28.80	28.80	37.00	48.00	50.00	53.00
26-75	60.00	60.00	78.00	101.00	106.00	111.00
75-100	90.00	90.00	117.00	152.00	160.00	168.00
100-150	120.00	120.00	156.00	203.00	213.00	224.00
150 and over	Daily fee	Daily fee	Daily fee	Daily fee	Daily fee	Daily fee

Source: Commonwealth Port Authority. "Proposed Amendments To The Commonwealth Ports Authority Seaport Division Terminal Tariff." Commonwealth Register, vol. 21, no 4. April 19, 1999

4.6.1.8. Cold Storage/processing

A significant constraint to local fisheries is the absence of an operational cold storage and/or processing facility with a consistent buyer. Fishermen must either sell their catch at dockside to whoever shows up, in self-owned stores or other retail outlets, by the roadside, or door to door. The absence of a cold storage or processing facility with a consistent buyer requires that fishermen spend time marketing their catch rather than catching more fish. Interviews with fishermen revealed that the absence of a local market where they could sell their fish to a buyer every day was the single greatest problem they face.

4.6.1.9. The Development of Guam as a Major Fishing Port.

During the 1990's, Guam has become a major fishing port in the Western Pacific Region. Longline and Purse Seine vessels operating in the region make port calls to Guam frequently to offload fish for transshipment and/or processing. These vessels also re-provision in Guam before

returning to the fishing grounds. The scale of these operations is far in excess of any commercial fishing operations currently taking place in the CNMI. To get an idea of the scale of these operations, table 4.67 provides the 1999 landings by longline vessels delivering to Guam. The Government of Guam, Department of Commerce provided the data.

Table 4.67: 1999 Guam Longline Vessel Landings (metric tons)

Month	Bigeye	Yellowfin
January	273.228	159.627
February	324.849	61.926
March	488.808	85.529
April	598.425	203.742
May	497.905	146.651
June	493.299	223.733
July	528.348	287.265
August	412.412	325.643
September	377.468	236.847
October	384.390	306.139
November	237.752	136.816
December	338.830	225.949
Annual Total	**4,955.714**	**2,399.867**

Source: Monthly Report on Tuna Offloading on Guam by Species. Guam Department of Commerce, March 24, 2000.

Note that the units of measure for the landings reported in table 4.67 are metric tons. The combined total tuna landing for 1999 was 7,355.58 metric tons, which equates to over sixteen million pounds of annual landings. Clearly, Guam is a major offloading port for longliners but it is also an important port for purse seiners as well. Table 4.68 shows port calls by fishing vessels in Guam in 1999. Japanese vessels led Longline port calls with 988. Taiwanese vessels were the next largest with 622 longline vessel port calls. Note that only 10 port calls were made by U.S. flagged longline vessels in 1999. This is a significantly small number because it indicates that there are currently very few U.S. flagged longliners operating in the region. The majority of vessels making port calls in Guam are foreign vessels that fish on the high seas and by access permit in the Exclusive Economic Zone of the Federated States of Micronesia.

Table 4.68: 1999 Port Calls by Fishing Vessels in Guam

Vessel Type and Flag	Total Port Calls
Fish Carriers/Reefers, all flags	149
Purseiners, US	7
Longliners, US	10
Purseiners, Japan	12
Longliners, Japan	988
Purseiners, Panama/Korea	58
Longliners, Panama/Korea	0
Purseiners, Taiwan	37
Longliners, Taiwan	622
Purseiners, other flags	12
Longliners, other flags	41
Annual Total	**1936**

Source: Guam Port Authority, Public Information Office, August, 2000.

There are many reasons why the port of Guam has developed into a major fishing port. Close proximity to the fishing grounds is only one of the reasons. Another reason is the seaport and airport facilities available in Guam. Other reasons include the availability of vessel servicing and supplies. Each of these is discussed further below.

4.6.1.10. Port of Guam Facilities

The Sea Port of Guam is located in Apra Harbor Guam and is a full service Container and break bulk port. A shipping channel into Apra Harbor that is between 40 and 100 feet deep serves the port. The port itself is a natural harbor that has been dredged and enclosed by a breakwater. The resulting harbor is on the lee side of Guam and is relatively well protected from storm events. In general, Apra harbor is calmer than Saipan harbor and offers safer temporary moorage facilities than the port of Saipan, which is not protected by a breakwater and is exposed to wave action during storms. Of course, neither facility can be considered typhoon proof. Several fishing vessels tied to the docks in Apra Harbor during Super Typhoon Paka broke their moorings and grounded on the breakwater.

The terminal facilities of the Port of Guam include 2725 feet of berthing space with an average depth of 34 feet. The port has 86,000 square feet of covered storage area, 26.5 acres (1.15 million sq. ft.) of open storage area, and is equipped with dockside fueling facilities, sewage discharge facilities and potable water outlets. The port is equipped with modern container offloading equipment including 3 shoreside gantry cranes with 30-40 ton capacity, 2 rubber tired mobile gantry cranes of 40 ton capacity each, and a 150 ton stick crane. A fleet of forklifts from 3 to ten tons capacity, 2 7.5-ton sideloaders, and 3 40-ton toploaders and 25 tractors are also available

Four ship repair companies including the Guam Shipyard, which is capable of large vessel haul out and repair at their dry-dock facilities, serve the Port of Guam. Fishing gear and vessel repair supplies and service are available through a local vendor located within the port area and at least one marine salvage, survey and services company is in operation in Guam. The Port of Guam is serviced by at least fourteen fisheries agents offering connections to Asian markets for fresh sashimi marketing as well as transshipment services. Cold storage and ice facilities have been developed to support these fishing operations.

Table 4.69: Port of Guam Wharfage Rates ($)

Cargo Type	Outbound	Inbound
Stuffed Containers, 25 feet and less	32.60/container	62.60/container
Stuffed Containers, Over 25 feet	55.50/container	107.50/container
Empty Containers, 25 feet and less	2.60/container	2.60/container
Empty Containers, Over 25 feet	3.50/container	3.50/container
Transshipment other than tuna	1.75/revenue ton	
Tuna Transshipment	3.50/revenue ton	
All other cargo	1.75/revenue ton	3.50/revenue ton

Source: Port Authority of Guam, Terminal Tariff. Government of Guam, Piti Guam, February 5, 1993.

The port of Guam is a duty free port. Currently, there are no import taxes or fees other than port entry, wharfage, dockage and stevedore fees. Immigration clearance is handled by the U.S. Immigration and Naturalization Service and can be done free of charge if during normal working hours. Visas for foreign crew can be arranged at a fee of $170 per vessel (pers. comm Benavente). However, if the crew remains on the vessel during port call no visa is required and no fee is charged.

The Port of Guam charges port entry fees to commercial vessels. However, commercial fishing vessels under 65 feet in length that are homeported in Guam are exempted from port entry fees. The fees are based on the gross tonnage of the vessel and begin at $25.00 for vessels of 1000 gross tons and under. Vessels between 1000 and 2000 gross tons are charged $51.00 for port entry. Vessels over 2000 gross tons are charged $51.00 plus $38.00 for each additional 2000 gross tons or fraction thereof.

Vessels that dock at the Port of Guam facilities for purposes of offloading must pay dockage fees to the port of Guam. These fees are charged on a 24-hour basis by vessel length.

Table 4.70: Port of Guam Dockage Rates ($).

Vessel LOA	Charge per 24 hour day	Vessel LOA	Charge per 24 hour day
0-100	37.00	**50-575**	663.00
100-150	55.00	**575-600**	736.00
150-200	72.00	**600-625**	840.00
200-250	128.00	**625-650**	977.00
250-300	188.00	**650-675**	1112.00
300-350	251.00	**675-700**	1251.00
350-375	308.00	**700-725**	1508.00
375-400	343.00	**725-750**	1663.00
400-425	379.00	**750-775**	1883.00
425-250	420.00	**775-800**	2113.00
450-475	457.00	**800-850**	2428.00
475-500	500.00	**850-900**	2764.00
500-525	565.00	**900 and over**	2764.00 + 3.40/foot over 900ft
525-550	608.00		

Source: Port Authority of Guam, Terminal Tariff.

The Port Authority of Guam controls the Agat and Agana marina facilities on Guam. The Agat Marina is a breakwater protected modern marina with floating docks, power hookups, water, and an onsite restaurant. However, it is subject to considerable storm surge during typhoons. Agat marina has slips of 25, 40 and 60 feet in length. The Agana boat basin is an older facility in need of enhancement. The entrance to Agana can be impassable in storms and heavy currents are often present at the entrance. Agana is primarily used by charter fishing boats and water recreation based tour vessels and has slips of 20, 30, and 40 feet. Both marinas appear to be fully utilized at this time. Fees currently listed in the Marina Rules and Regulations of the Port Authority of Guam are shown in table 4.72 and are comparable with rates charged in the CNMI.

Table 4.71: Port of Guam Marina Fees

Slip Length	Recreational	Commercial	Live aboard
Permanent: Agat, 25-60 feet	5.50	8.50	8.50
Permanent: Agana, 20-40 feet	1.25	2.00	6.00
Transient: Agat 25-60 feet	6.00	9.50	n/a
Transient: Agana 20-40 feet	6.00	9.50	n/a

Source: Marina Rules and Regulations of the Port Authority of Guam, Government of Guam, May, 2000.

The A.B Won Pat International Airport in Guam underwent major renovations in the 1990's and is serviced daily by commercial wide bodied jet aircraft such as Boeing 747's and DC-10's. The terminal facility is of modern architecture and state of the art systems. Continental Micronesia has made the Guam airport its regional hub and operates daily flight to and from Japan and Hawaii as well as weekly regional flights to Australia, Indonesia, the Marshall Islands, Federated States of Micronesia and Palau. In addition, Northwest Airlines operates a Guam-Tokyo route and Japan Airlines and Asiana Airlines service Guam as well.

4.6.1.11. Comparison of Guam and Saipan Port Rates

Table 4.72: Cost Comparison: Port of Guam vs. Port of Saipan Non-Homeported Commercial Tuna Fishing Vessel landing Cost for a vessel under 100' and 1000 gross tons.

Port	Trans-shipment rate	Cargo Rate	Port Entry	Dockage	Immigration
Saipan	$1.08/ton	$4.25/ton	$81/entry	$73/24 hrs.	$100/vessel
Guam	$3.50/ton	$3.50/ton	$25/entry	$37/24 hrs.	0*, $170/vessel

*****US Immigration in Guam is free only if crew stay on board the vessel and the vessel clears during normal working hours. In the CNMI, the crew would be granted visas as part of the fee but if they stay on board the vessel the fee still applies.

The comparison of port costs shows that the CNMI is more expensive than Guam in all categories except transshipment. In addition, if a Commercial Fishing vessel is homeported in Guam and under 65 feet in length it will not be assessed a port entry fee. However, the CPA tariff schedule makes no such variance for homeported vessels and specifically states that "All vessels (except military and government-owned vessels) shall pay a PORT ENTRY FEE…when entering a CNMI port or refueling within the waters of the Commonwealth of the Northern Mariana Islands. One point that must be made is that homeported vessels do not always clear out of their homeport when they go out fishing and presumably would not be required to clear back in. Under such circumstances, the port entry fees and immigration fees would likely not apply.

4.6.1.12. The Guam Fishermen's Cooperative

Fishermen in Guam have the added advantage of membership in the Guam Fishermen's Cooperative. The cooperative allows membership by a wide variety of fishermen including occasional commercial fishermen, charter fishing operations, and recreational vessels. Currently the cooperative has 230 members most of which are part-time fishermen. In this way, the cooperative insures that it will have a consistent supply of product.

The Guam Fishermen's cooperative has registered with the Government of Guam as a non-profit organization so that it has a tax free status. This means that it does not have to pay liquid fuels tax. Because of their tax status, the cooperative can currently provide fuel to its members at $1.35 per gallon of gasoline and $1.40 per gallon of diesel. This gas price is about $.70 per gallon less than in Saipan. Saipan pelagic fishermen generally fuel at automotive service stations and receive no break on the $.15 per gallon liquid fuels tax currently charged by the CNMI government. The coop also provides ice at $1 per 10lb bag, $2 per 23lb bag and $2.20 for a 15 pound block. In contrast, a ten-pound bag of ice in Saipan costs about $1.25.

The Guam coop utilizes an account system so that members can purchase fuel and ice on account and net their costs against their fish sales. This allows a coop member to buy fuel on credit even

if the fishing has been slow. Some CNMI fishermen reported having difficulty getting fuel for the next day if they couldn't sell enough fish. The credit system utilized by the Guam Fishermen's coop eliminates that problem. This system is far superior for the fishermen than the consignment system practiced by some market operators in the CNMI. The Guam Fishermen's coop also helps its members with emergency loans.

While all the above features of the Guam Fishermen Coop are impressive, what must be made clear is that the cooperative must recover its operating costs and must compete directly with fish landed in the port by both domestic and foreign longliners. As a result, the ex-vessel price per pound that the Guam Fishermen's coop pays its members for skipjack tuna was reported to be $1.25 per pound on August 28, 2000. This price is about $.75 per pound less than the average price CNMI pelagic fishermen reported receiving.

The Guam coop operates their own store and processing facility capable of filleting, vacuum packaging and freezing. The facility is small and efficient in order to minimize operating costs. They sell fish to other retail stores, in their store front, and to government sources. The cooperative resells skipjack loins at a wholesale price between $1.59 and $2.29 per pound and at $3.99 per pound in their retail store. Depending on quality, the coop $2.00 to $2.75 per pound for headed-gilled-gutted yellowfin tuna that are sold in their retail store at $6.99 per pound for loins. Wahoo and mahimahi bring ex-vessel prices of $1.75 to 2.25 per pound and yield a retail price of $6.99 per pound for fillets. Marlin was priced at $1.25 per pound with fish over 300lbs. at only $.50 per pound. Marlin steaks and or loins were listed at $4.99 per pound in the retail store. Thus, the coop charges a markup of more than two hundred percent from ex-vessel to retail market prices. The point of this is that while the benefits of membership in the cooperative are many, the price received by fishermen is much less than what CNMI fishermen are currently getting. It is true that costs, especially for fuel, are also much lower. However, it must be understood that a cooperative of this nature is not a panacea and some fishermen may prefer to continue selling direct to their market rather than to a middleman processor.

4.6.1.13. Fuel Price in Guam and Saipan.

Critical factors in evaluating infrastructure for fisheries development are the availability and price of marine fuels. Exxon-Mobil and Shell Oil serve both Guam and Saipan. However, the fuel storage facilities available in Saipan are limited in size and the harbor channel dimensions do not allow large tankers to deliver to Saipan. As a result, fuel prices are much higher in Saipan than in Guam. In addition, fuel prices in Tinian and Rota are around ten cents per gallon higher than in Saipan. Table 4.73 provides a comparison of fuel rates in the region. Local Pelagic fishermen in the CNMI usually fill up at roadside service stations. There are two Mobil Oil small boat fuel docks available in the Port of Saipan, however, they charge the same rates as the roadside service stations.

Table 4.73: Fuel Price Comparison

Vendor	Regular Gasoline	No. 2 Marine Diesel
Mobile fuel dock (Saipan)	$2.13	$2.00
Shell Oil Saipan (bunkering)	n/a	$1.75
Guam Fishermen's Coop.	$1.35	$1.40
Shell Oil Guam (bunkering)	n/a	$1.25

Source: Shell Oil, Mobil Oil, Guam Fishermen's Cooperative

The current price of regular unleaded gasoline, which is used by the outboard motor powered pelagic small boat fleet, is $2.13 per gallon. In comparison, fishermen in Guam who are members of the Guam fishermen's cooperative can purchase gasoline for $1.35 per gallon. Thus, fishing vessel cost for fuel in Saipan is almost sixty percent higher than in Guam. As was shown in table 4.19, fuel was the single largest component of variable trip costs in the CNMI pelagic fishery.

One of the reasons that the Guam Fishermen's Cooperative can charge so much less is that they have organized themselves as a not for profit enterprise and are not subject to liquid fuels taxes. The liquid fuels tax in the CNMI is 15 cents per gallon. In addition, the Guam Fishermen's Cooperative has the ability to negotiate volume discounts that they can pass on to their members. Further, fuel delivered in the Port of Guam is not subject to gross receipts taxes because the Port of Guam is a duty free port. Thus, the base cost of fuel is likely lower in Guam than in the CNMI where fuel suppliers do have to pay business gross receipts tax of five percent.

There is also a substantial difference in fuel costs between Guam and the CNMI for marine diesel fuel. The Guam Fishermen's cooperative sells diesel for $1.40 per gallon as compared to the $2.00/gal charged on Saipan. Large volume purchases (over 1000 gallons) can be bunkered by truck directly to larger vessels in both the Port of Guam and the Port of Saipan. However, the cost of bunkering diesel in Guam is only $1.25 per gallon as opposed to $1.75 per gallon on Saipan. Volume discounts can be arranged in both locations. What is clear from this data is that a large scale fishing vessel purchasing 1000 gallons of diesel fuel would save $500 by fueling in Guam rather than Saipan. These savings are on top of cheaper port charges in the Port of Guam as well as the closer proximity of Guam to major fishing grounds. Thus, the Port of Saipan is not cost competitive with the Port of Guam nor does is provide the extensive services sought by commercial fishing vessels.

4.6.2. Problems Encountered

The only problem encountered was obtaining written fuel price quotes from Exxon/Mobil. This could be the result of sensitivity on the part of the fuel providers due to interest on the part of the CNMI Attorney General's Office to investigate potential fuel price fixing in the Commonwealth.

4.6.3. Conclusions and Recommendations for Additional Work

In general, the infrastructure available in the CNMI is adequate to serve the current small boat pelagic fishery. However, the focus on infrastructure development has been on containerized shipping to support the garment and tourism industries not on large-scale fisheries development. There is no dedicated area for fishing vessels to tie up on a short-term basis other than the container ship docking area. Further the tourism industry is the primary industry and is considered to be a relatively clean industry. Commercial fishing, in contrast, is thought by some to be a dirty industry. The compatibility between a large-scale commercial fishing industry and the tourism industry is in doubt. The adequacy of the available infrastructure on each island is summarized below.

Saipan:

Saipan launch facilities to support the existing small boat pelagic fleet are adequate but in need of repair for low tide conditions and the ramp at Sugar Dock needs improved parking. The planned new ramps may be of added benefit; however, available long-term moorage facilities for larger fishing vessels are inadequate and are not typhoon safe. Short-term fishing vessel moorage

facilities at the seaport are adequate but are also not safe during storm or typhoon events. Seaport facilities for vessel offloading are adequate, however, fish cold storage holding capabilities and processing facilities are currently inadequate to promote large scale pelagic fisheries development. In addition, ship repair services are available but large vessel haul out facilities are not adequate to support large scale fishing ventures and fishing vessel supplies (gear, ice, bait, salt) are not currently available. On a more positive note, airport facilities for transshipment of sashimi tuna to Asian markets are adequate and the airport is served by daily flights to destinations in Asia. Also, Saipan has adequate provisioning available via its many grocery stores and wholesalers including a Price-Costco store.

In general, Saipan can provide the infrastructure needed for short term vessel mooring and offloading if a fishing enterprise were willing to develop some sort of cold storage holding capacity. Air transport facilities are also capable of handling fresh sashimi tuna transport. However, as has been discussed above, the Port of Saipan is not cost competitive with the Port of Guam. Port fees, fuel, and taxes are all higher at the Port of Saipan than at the Port of Guam. The Port of Saipan does have a better transshipment rate, however, it does not make up for the other costs that a vessel would incur in delivering to Saipan instead of Guam. The Port of Saipan does not provide the vessel services available in Guam, and is not as close to the prime fishing grounds in the region. On a competitive basis, the infrastructure available in the Port of Saipan is not adequate to promote the development of large-scale pelagic fisheries.

Tinian:

Launch facilities for the small vessel pelagic fishery are adequate, however, mooring facilities for fishing vessels are in need of major repair and can not be considered safe during storms and typhoons until repair is undertaken. The existing cold storage facility is non-functional and much too large for utilization by the current small boat fishery but if made operational could support longline ventures as a holding and or freezing facility. Airport facilities for transshipment are not adequate but will be adequate once the airport expansion is completed. Ship repair services and large vessel haul out facilities are not available nor are fishing vessel supplies (gear, ice, bait, and salt). Provisioning facilities are minimal but could provide provisions for short trips or with advanced notice.

Tinian is in a unique position in the Commonwealth with regard to being able to support large scale fishing operations. Renovation of the port combined with the airport expansion and utilization of the cold storage facility could make Tinian a possible location for Sashimi grade fresh tuna transshipment to Asian markets as well as frozen tuna transshipment to canneries. The added benefit for vessel delivering there would be the possibility of crew recreation at the Tinian Dynasty Hotel and Casino. However, Tinian will still have to compete with Guam on a comparative cost basis to lure fishing enterprises to deliver there. It is not clear that Tinian or any port in the CNMI will be able to be cost competitive with the port of Guam especially given that the Commonwealth Ports Authority intends to raise its rates in the future.

Rota:

Launch facilities to support the existing small boat pelagic fleet are adequate. Available long term and short term moorage facilities and offloading facilities for large fishing vessels are minimally adequate at the port pier. The physical size of the channel and turning basin limits the size of vessels that can be accommodated. The Port facility is in need of expansion and a breakwater and is questionable as to its safety during heavy weather. Seaport facilities for vessel offloading and fish cold storage holding are inadequate and processing facilities are not available.

In addition, the airport facilities for transshipment are inadequate but may become adequate with renovation of the runway and re-introduction of jet service. Ship repair services and haul out facilities are not available nor are fishing vessel supplies (gear, ice, bait, and salt). Provisioning facilities are quite limited and expensive. Development of large-scale fishing based in Rota is not likely unless significant development of the port facilities is undertaken.

4.7. REGULATORY AND FINANCE CONSTRAINTS

This section reviews the authorities and regulations that currently apply to the fisheries of the Commonwealth of the Northern Mariana Islands. The availability of loan finance to support fisheries is also reviewed. The purpose of these reviews is to determine whether domestic fisheries development is constrained by either finance or regulatory structures.

4.7.1. Accomplishments and Findings

This study has found that considerable disagreement exists over ownership and resource management rights to the Exclusive Economic Zone adjacent to the CNMI. The dispute is now a matter of court challenge, which creates considerable uncertainty over jurisdictions. The review presented below discusses applicable regulations on both the federal and local levels.

4.7.1.1. Regulatory Jurisdictions

The Commonwealth government enacted The CNMI Marine Sovereignty Act in 1980. The Act declares "...that the sovereignty of the Commonwealth extends beyond its land area to its internal waters, archipelagic waters and territorial sea regardless of their depth or distance from the coast, as well as to their air space, seabed, and subsoil, and the resources contained therein." The act further declares that "the Commonwealth has sovereign rights in the exclusive economic zone for the purpose of exploring, exploiting, conserving, and managing the natural resources, whether living or non Living, of the seabed, subsoil, and superadjacent waters of such zone, and with regard to other activities for the economic exploitation of the zone...."

The Act defines the territorial sea as the sea extending from the archipelagic baseline out to 12 nautical miles. Further, the CNMI Exclusive Economic Zone (EEZ) is defined as the waters extending from the territorial sea out to 200 nautical miles from the baseline. In cases where the EEZ extends into a similar zone of an adjacent state the outer boundary of the CNMI EEZ is defined by a line drawn equidistant between the baseline of the CNMI and a similar line of the adjacent state.

The intent of Act is to lay claim to ownership and authority over the natural resources of the 200-mile EEZ adjacent to the Commonwealth. The act identifies the "special relationship between the Commonwealth and the United States." The act states that "nothing in this Chapter shall be taken to impose any impediment to any lawful action taken by the Government of the United States for the defense and security of the Commonwealth or of the United States; provided, that the United States takes every practicable precaution to protect the marine environment and complies with any applicable federal law." Thus, while the CNMI Marine Sovereignty Act claims sovereignty over marine resources, such as fisheries, it specifically defers sovereignty over defense and security to the United States. This effectively means that the CNMI intends to regulate marine resource use but to rely on the United States for military defense and security.

In 1982, following completion of the United Nations Convention on the Law of the Sea, President Ronald Reagan claimed a 200 mile Exclusive Economic Zone adjacent to the states, territories, and commonwealths (including the CNMI) of the United States via presidential proclamation 5030. In 1983, the United States amended the Magnuson Fisheries Conservation and Management Act to make it applicable to the CNMI. The amendment extended fisheries conservation and management jurisdiction in the EEZ adjacent to the CNMI to the Western Pacific Regional Fisheries Management Council (WPRFMC), which is headquartered in Honolulu. It is also interesting to note that the CNMI is not listed in the United States Territorial Seas Act, which effectively established territorial seas of 3 nautical miles around the States, Territories and Commonwealths of the United States. Thus, under current Federal law, the CNMI does not possess a territorial sea.

The Magnuson Act requires that one of the 13 voting members of the Western Pacific Regional Fisheries Management Council be the principal CNMI official with marine fishery management responsibility and expertise who is designated by the Governor of the CNMI so long as the official continues to hold such position, or the designee of such official (16 U.S.C. 1852-MSFCMA SEC. 302.b.) When the Magnuson Act was amended to include the waters adjacent to the CNMI, it also became necessary for the Governor of the CNMI to appoint a voting council member from the CNMI. However, the CNMI refused to participate and appoint a voting member of the Council on the grounds that the CNMI Marine Sovereignty Act claimed the EEZ for the CNMI and that the United States had no jurisdiction over fisheries in the waters of the EEZ adjacent to the CNMI.

In 1993, the United State Government provided written assurances that participation in the Council would not relinquish the CNMI claim to ownership of the EEZ and Territorial Sea. Following those assurances, a voting member was appointed and the CNMI began to participate in the Council proceedings. However, the CNMI maintains that its claim to ownership of the marine resources within the Exclusive Economic Zone adjacent to the CNMI is valid under international law as well as under the laws of the United States. In addition, the CNMI claims ownership of the EEZ via the Commonwealth's Covenant agreement with the United States. The CNMI also maintains that the similar claim to such ownership made by the United States via Presidential Proclamation 5030 is not valid under international, Federal, or CNMI law.

In 1998, the CNMI Government sought judgment on the issue of EEZ and Territorial Sea ownership by filing a lawsuit in Federal Court. The purpose of the lawsuit is to obtain a ruling that nullifies the United States claim to ownership of the marine resources in the waters of the EEZ and territorial sea of the CNMI. The status of this lawsuit is unknown. If the CNMI wins the lawsuit, the CNMI claim to ownership of the marine resources of the EEZ and Territorial Sea, as declared in the CNMI Marine Sovereignty Act of 1980, would presumably be affirmed and the claim of the United States would presumably be fully or partially voided.

If the United States successfully defends its claims over the EEZ and Territorial Sea adjacent to the CNMI, then the authority of the Western Pacific Regional Fisheries Management Council and the United States National Marine Fisheries Service (NMFS) would presumably be affirmed. However, it is possible that some form of compromise and/or settlement of this lawsuit might be reached between the CNMI and the United States. One can only speculate what the outcome will be.

The CNMI Fisheries Act was introduced in 1998 to establish jurisdictions and regulations, and to advance the CNMI's claim to the EEZ while the lawsuit against the Federal government is pending. In fact, the CNMI Fisheries Act was drafted by the attorneys representing the CNMI in the EEZ lawsuit. The Act did not exit committee and was never voted on, however it was reintroduced in 2000 and is currently being considered by the Commonwealth legislature. If enacted, the CNMI Fisheries Act would:

- grant jurisdiction over all fisheries management in the EEZ to the CNMI Department of Lands and Natural Resources(DLNR).
- establish rules requiring local licensing of all fishing vessels and fishermen regardless of size or whether the vessels are federally documented
- establish a three percent royalty charge on the value of all fish caught in the waters of the EEZ adjacent to the CNMI but only one and one half percent for people of NMI indigenous descent.
- require the licensing of all fish dealers
- grant to the Secretary of DLNR the right to limit access to the fisheries
- grant to the Secretary of DLNR the right to limit harvest of fish species
- create preferential fishing rights for indigenous people

Many of these provisions are in conflict with United States laws and jurisdictions as defined in the Magnuson-Stevens Act of 1996. Ultimately, the ability of the CNMI to enforce these provisions will depend on the outcome of the current lawsuit over ownership of the marine resources of the EEZ adjacent to the CNMI. If the CNMI is not successful in the EEZ ownership lawsuit it is not clear that provisions of the CNMI Fisheries Act would be enforceable on NMFS permitted U.S. longline vessels. Under federal law, such vessels Guam are legally able to operate in the open waters of the EEZ adjacent to the CNMI, Guam, American Samoa, and even Hawaii if they hold a valid Hawaii limited entry permit.

The NMI fisheries act stated that it is a policy to encourage the development by the domestic fishing industry of fisheries currently underutilized or not utilized by United States Fishermen. However, the act imposes royalties on the domestic fishery. The domestic fishery has had difficulty developing and has not achieved the harvest levels of the Japanese fleet that operated in the waters of the Commonwealth during the 1960s and 1970s. Imposition of a tax in the form of royalties seems counter to the policy of encouraging domestic development. The NMI fisheries act also allows a performance bond or other guarantee to be required of any operator of a fishing vessel in the waters of the Commonwealth. This may be a considerable added cost of doing business.

4.7.1.2. Specific United States Fisheries Regulations

Many of the regulations described in this section do not currently apply to the small fishing vessels employed in the pelagic fishery of the CNMI. However, these regulations would apply to vessels that might enter a longline fishery and some of these regulations might apply to local small fishing boats in the future.

Vessel Documentation:

Federal documentation of vessels in excess of 5 net tons that are used for commercial fishing in the waters of the United States is required by US Law (46 USC Sec. 12108). The United States Coast Guard enforces this requirement. U.S. documented vessels must apply for a fishery

endorsement in order to operating in fisheries of the United States. Under the vessel documentation regulations (46 USC Sec. 12108) there are several specific requirements that a fishing vessel must meet. These requirements are as follows:

- The vessel must be at least 5 net tons
- The vessel must not be registered under the laws of a foreign country
- The vessel must not be titled in a State (presumably also applies to the CNMI)
- The vessel must be measured according to the requirements of the vessel documentation center, though a temporary certificate of documentation may be issued prior to measurement.

If these conditions are met the vessel is eligible for documentation provided that the vessel meets certain ownership requirements. The primary requirement is ownership by United States Citizens. However, there are several ways that minority foreign ownership will be allowed. These are as follows;

- A partnership whose general partners are citizens of the United States, and the controlling interest in the partnership is owned by citizens of the United States.
- A corporation established under the laws of the United States or of a State, whose president or other chief executive officer and chairman of its board of directors are citizens of the United States and no more of its directors are non-citizens than a minority of the number necessary to constitute a quorum

Note however that the regulations state that a vessel that is owned by a corporation is not eligible for a fishery endorsement unless the controlling interest, as measured by a majority of voting shares in that corporation, is owned by individuals who are citizens of the United States. Thus, United States citizens must hold controlling interest of fifty-one percent for vessels owned by a corporation.

Fishery Endorsement of Vessel Documentation:

Vessels that meet the general documentation requirements must also apply for a fishery endorsement to participate in commercial fisheries in U.S. waters. The fishery endorsement requirements that apply to the CNMI, Guam, and American Samoa are very different from the requirements for the rest of the United States, other U.S. territories, and other U.S. Commonwealths. Specifically, according to 46 USC 12108 a fishery endorsement to engage in fishing in the territorial seas and fishery conservation zones adjacent to Guam, American Samoa, and the CNMI may be issued if the vessel;

- Is under 200 Gross tons as measured under section 14502 of 46 USC or an alternate tonnage measured under 14302 of 46 USC as Secretary under section 14104 of 46 USC.
- Was not built or rebuilt in the United States
- Is eligible for documentation (over 5 net tons and meeting ownership requirements)
- Otherwise qualifies under the laws of the United States to be employed in the fisheries.

This is in contrast to the standard requirements for fishery endorsements for the fisheries of the rest of the United States, which require that the vessel be built in the United States and if rebuilt be rebuilt in the United States. A foreign built vessel of between 5 net tons and 200 gross tons that is owned by a U.S. citizen or a Partnership or Corporation with a majority U.S. ownership

and control technically qualifies for a fishery endorsement to engage in commercial fishing only in the territorial seas and fishery conservation zones adjacent to Guam, American Samoa, and the CNMI. Note that this endorsement will only be for fishing and that no endorsement for coastwise trade (marine transportation) will be issued to any foreign built vessel.

United States Coast Guard Captain and Crew Requirements:

There are specific U.S. Coast Guard requirements regarding the citizenship and licensing of the vessel Captain and Crew. These requirements depend on the vessel size and whether it is documented or not. Currently, a documented fishing vessel under 200 gross tons is not required to have a U.S. Coast Guard licensed Master or crew. However, the vessel operator must be a United States Citizen. Further, the master, chief engineer, radio officer, or officer in charge of a deck watch or engineering watch on a documented vessel must be a U.S. citizen regardless of the tonnage of the vessel.

There are specific rules regarding citizenship of the crew that only apply in the CNMI. The standard rule in U.S. Fisheries is that non officer crew must be seventy-five percent U.S. citizen and only twenty-five percent foreign. However, it has been determined by the U.S. Coast Guard that alien guest workers that are properly documented to work in the CNMI may work as crew aboard fishing vessels and the *75/25* percentage split does not apply in the CNMI (pers. comm Hilton, 1999).

The United States Officers Competency Certificates Convention of 1936 (46 USC 8304) placed additional requirements on vessels greater than 200 gross tons. The convention required that masters, mates, and engineers on vessel that are 200 tons or larger and operate in the EEZ must be United States Coast Guard licensed.

United States Coast Guard Fishing Vessel Safety Requirements:

The U.S. Commercial Fishing Industry Vessel Safety Act (CFIVSA) was passed in 1988 (46 USC 45). The CFWSA required the U.S. Coast Guard to issue and enforce vessel safety regulations. The specific regulations depend on the size and type of vessel used, the number of crewmembers, the distance from the coast that the vessel operates, water temperatures in the area the vessel operates and several other vessel characteristics. The regulations are far too specific to comprehensively list here and consultation with the U.S. Coast Guard is advised for anyone interested in determining the exact requirements for a specific vessel. The point of mentioning the Act here is to identify it as an applicable regulation that commercial fishing vessels, such as pelagic longliners, must adhere to. It was observed during the course of this study that few of the vessels currently operating in the commercial pelagic fishery of the CNMI are in compliance with this regulation.

Pelagics Fisheries Management Plan (PFMP):

The Western Pacific Regional Fisheries Management Council adopted a Pelagic Fisheries Management Plan (PFMP) that applies to the CNMI. (50 CFR part 685**,** and 60 CFR part 660). The PFMP establishes guidelines and procedures for management of the fishery. It also establishes mechanisms for the Western Pacific Regional Fisheries Management Council to manage the fishery by setting allocations and harvest levels as well as limitations on effort and gear. The pacific pelagic management unit Species covered by the plan include mahimahi, marlin, spearfish, oceanic sharks, sailfish, swordfish, tunas and related species, and wahoo.

The specific rules and requirements of the PFMP are extensive. However, they currently only apply to longline vessels. Pole and line, troll, and jig vessels fishing for Pelagic Management Unit Species are not required to comply with the regulations listed below. These rules cover only the pelagic species. There is a separate bottomfish management plan that defines rules for bottomfishing vessels. Since this report focuses on pelagic species the bottomfish plan is not discussed.

Longline Permits

The PFMP (Section 685.9) requires any vessel of the United States that operates shoreward of the outer boundary of the fishery management area (inside the EEZ) that uses longline gear to fish for pacific pelagic management unit species, or that possesses, receives, transships, or lands management unit species that were taken by longline gear must have a permit. The permit application must be submitted to the NMFS Pacific Area Office in Honolulu at least 15 days prior to the date that the applicant wishes to begin fishing using longline gear. Within 15 days of receipt of the properly completed application, the Regional Director of the NMFS shall decide whether to issue a permit. There is currently no fee for this issuance of the permit and the waters of the CNMI are not subject to a limited entry program at this time. Once a permit is issued, any changes in the permit holder's information must be reported to the Pacific Area Office 10 days prior to the change becoming effective.

It is important to note that a longline permit issued under the PFMP would entitle the holder to fish in U.S. waters anywhere in the Western and Central Pacific that is not subject to limited entry management or closed areas. There are currently closed areas around Guam and American Samoa and the Hawaii longline fishery is subject to limited entry. However, a vessel homeported in Guam or the CNMI that obtains a NMFS longline permit for the region is entitled to fish in the open waters around Guam and American Samoa as well as the waters of the EEZ adjacent to the CNMI and on the high seas. Thus, NMFS permitted longline vessels based in Guam can fish in CNMI waters and deliver to Guam without entering port in the CNMI and vice versa. So long as this regulatory structure is in existence, the much lower operating costs available in Guam would tend to dictate that locally based longline fishery development would be based in Guam not the CNMI.

Logbooks

Longline vessels are required to keep detailing fishing log books while at sea. Along with general information identifying the vessel, the logbook must also contain information on the gear that is set including when and where it is set, how much gear is set, as well as use of lightsticks. In addition, the logbook must contain information on the number of pelagic management unit species caught, kept, and released each day. Interactions with protected species, such as Albatrosses and turtles must also be reported.

Transshipment vessels must also maintain a log book that provided information on the fishing vessel from which fish is received. The log must including vessel name, radio call sign, date of transshipment, number of days fished by the fishing vessel, average number of hooks fished, general area of the catch, number of pelagic management unit species transshipped and the total weight of the transshipment.

Fishing and transshipment logs must be recorded on forms that are provided by the Pacific Area Office of the NMFS. The logs must be recorded within 24 hours of the hauling of longline gear or the transshipment of fish and must be submitted to the Pacific Area Office or a designated representative within 72 hours of the date of landing. The logs must be made available for immediate inspection upon request of an authorized office or employee of the NMFS.

Vessel Identification

Each longline vessel must display its official number (granted in the permit) on the port and starboard sides of the deckhouse or hull, and on an appropriate weather deck so as to be visible from enforcement vessels and aircraft. The official number must be in block Arabic letters at least 18 inches (45.7cm) in height for vessels at least 65 feet in length and ten inches (25.4cm) in height on smaller vessels. The number must be clearly visible, in good repair, of a color that contrasts with its background, and no part of the vessel, its rigging, or its gear shall obstruct the view of the official number from enforcement aircraft or vessels.

Protected Species Conservation

Aside from the logbook recording requirements of protected species interactions, the Regional Director of the National Marine Fisheries Service, with the concurrence of the Western Pacific Regional Fisheries Management Council may adopt additional measures by initiating a rulemaking. These measures could include additional reporting requirements, enlarged protected species zones where fishing is not allowed, gear restrictions, requiring observers or adopting any other management measures necessary to protect threatened or endangered species. Currently, there are no closed areas, protected species zones or observer requirements that apply to the waters of the CNMI. However, the PFMP does bans the use of drift gillnets.

Longline Gear Identification

Every longline buoy and float must be labeled with the official number of the longline vessel. All buoys and floats must be so labeled whether deployed or possessed on board the vessel. The official number must be legible and permanent and of a color that contrasts to the background. Any unmarked longline gear found deployed in the EEZ will be considered unclaimed or abandoned property, and may be disposed of in any manner considered appropriate by the National Marine Fisheries Service.

Notification of Landings, Transshipments, and Protected Area Transit

Longline vessel operators and longline transshipment vessels are required to notify the NMFS Pacific Area Office by telephone within 12 hours of the vessel's arrival at any port in Hawaii, Guam, American Samoa, the Northern Mariana Islands, or U.S. possessions in the Pacific Ocean. The report must include the name of the vessel, the name of the vessel operator, the date and time of each landing or transshipment of Pelagic Management Unit Species since its previous report of landings and transshipments. Any longline fishing vessel transiting the protected species zones shall notify the NMFS immediately upon entering and immediately upon departing the protected species zone. The notification report must identify the vessel, the vessel operator, date and time of entry and exit and location in latitude and longitude to the nearest minute.

Longline Fishing Prohibited Areas

The PFMP lists several longline fishing prohibited areas. Most of these areas are around the Hawaiian Islands. None of these areas currently exist in the waters of the EEZ adjacent to the CNMI. However, Guam does have a longline-prohibited area. Thus, it is possible that a longline-prohibited area could be adopted around the islands of the CNMI. The goal of such a closure would be to limit gear conflicts with the local small boat troll fishery.

4.7.1.3. CNMI Regulations

CNMI Vessel Registration:

The CNMI Boating Safety Division has authority over registration requirements on vessels less than 5 net tons (ineligible for federal documentation). Further, the CNMI Boating Safety Division has authority over near shore enforcement of local regulations. An inspection of the vessel will be required to ensure that on board personal flotation devices, signaling devices, and a fire extinguisher are serviceable. The registration must be renewed annually.

Local Commercial Fishing Regulations:

The CNMI Division of Fish and Wildlife within the Department of Lands and Natural Resources has exclusive jurisdiction over all aspects of fisheries within the CNMI (CNMI Office of the Attorney General). The CNMI Division of Fish and Wildlife has issued very few local commercial fishing regulations. The most significant is the ban on the use of drift gill nets of any kind as required by federal law. However, there are no local catch limits, size limits, or logbook recording requirements. Further, there is currently no requirement for receipts or "fish tickets" to be completed and turned in to the government when fish are sold at dockside. There are no license requirements for commercial fishing vessels or crew other than vessel registration with the CNMI Boating Safety Office. The only license that is required is a commercial fishing business license that is obtained from the CNMI Department of Finance.

Department of Finance Regulations:

The Business License division of the Department of Finance (formerly of the Department of Commerce) requires that commercial fishing businesses that operate vessels in excess of 5 net tons must obtain a commercial fishing business license. A fee of $50 per ton of the vessel will be charged. This license is in addition to any federal fishing permit that may be required.

Commercial fishing income is exempt from taxation up to $5,000 per quarter or $20,000 per year. Income in excess of these amounts per quarter and/or annually is subject to the CNMI Business Gross Receipts tax. The BGR tax on fish and agricultural produce differs from the standard BGR on other goods and is defined in Public Law 9-22. The current rate charged for fishing businesses is one percent (CNMI Department of Finance, 2001).

Commonwealth Port Authority (CPA) Regulations:

The Commonwealth Ports Authority has jurisdiction over vessels operating within the sea ports of the CNMI. Commercial vessels entering ports of the Commonwealth are usually required to contact port control on VHF channel 13 for clearance. CPA also controls the processes of seaport clearances. Port clearances are required for vessels entering ports of the CNMI from a foreign port (including Guam). In such instances, the vessel must be cleared before crew or cargo can be landed. Vessels that are returning to port from fishing but have not made a port call in a foreign

port are required to clear through port control but do not have to clear customs, immigration, or quarantine. The CPA administers port clearance in cooperation the Department of Labor and immigration, The Division of Customs, and The Division of Quarantine. Each of these agencies have offices and staff at the CPA seaport office at Charlie Dock in the Port of Saipan. In other ports of the Commonwealth, the CPA will arrange for vessels needing clearing to be met by necessary officials. Note that vessels needing clearance will not be charged for the time of the clearance officers so long as clearance is conducted during normal business hours. Outside of normal hours, including holidays, overtime wages will be charged to the vessel needing clearance.

Division of Quarantine Regulations:

As part of port clearance procedures, the Division of Quarantine will conduct quarantine inspections of vessels entering the CNMI from foreign ports. Quarantine will confiscate any items not allowed entry, such as produce. Further, Quarantine will require that all garbage on board the vessel be disposed of via the Port Authority so that it may be incinerated. Note that these requirements only apply to vessels that have made a foreign port call and are returning to the CNMI. Vessels fishing within the EEZ adjacent to the CNMI that are returning to port will not be required to clear quarantine.

Division of Customs Regulations:

In addition to clearing vessels entering from foreign ports, the CNMI Division of Customs is responsible for inspection of incoming cargo for customs clearance and assessment of import duties. In the CNMI, all commercial products that are imported are subject to an import tax of five percent. Thus, a locally controlled partnership or corporation that purchases a vessel outside of the commonwealth and brings it into the commonwealth will be subject to these import taxes. This will also be true of gear and supplies purchased outside of the CNMI and shipped in. The CNMI Division of Customs will assess these taxes at the time of customs clearance.

4.7.2. Financial Review

Commonwealth Development Authority (CDA)

The CNMI Commonwealth Development Authority was founded in 1986 and serves the CNMI as the Northern Marianas Development Bank. It consists of two divisions; A Development Banking Division and a Development Corporation Division. The Development Banking Division focuses on the financing of capital improvement projects. The Development Corporation Division serves the Commonwealth with loan finance for economic development. The purposes of the Development Corporation Division listed in the 1998 CDA Annual Report are as follows;

- To initiate, stimulate, and facilitate development of the economy of the Commonwealth for the economic and social advancement of the people of the Commonwealth by making loans and giving financial, technical, and advisory assistance in its discretion to the private sector in the Northern Marianas
- To encourage the development of technical expertise in business and financial management by cooperating with government and private groups, and providing training services.
- To assist in the identification, formulation, and promotion of new projects.

In fulfilling these purposes, the CDA Development Corporation Division serves as the primary source of loan finance for local development projects including commercial fishing ventures. Any individual or corporation wishing to obtain financing from CDA must complete a loan application package. The loan application requires information regarding the business, stockholders, use of the loan proceeds, real estate collateral, personal property collateral, debts, and management structure. A section specific to commercial fishing loans asks questions on current fishing activities, experience level, crew compensation plan, fishing method, anticipated price per pound, and potential markets. In addition to the application, a personal financial statement and business financial statement including projected income and costs for the first year must be completed. For Corporations, the personal financial statement must be completed for each principal stockholder holding at least twenty percent of the corporate stock.

Aside from the loan application and financial statement, CDA requires several supporting documents. These include a Business Plan, Land Documents, Property Map, Declination letter from at least one commercial bank, Resume, authorization for a credit check, payment of credit check fee of $10.00, and tax compliance certification from the Division of Revenue and Taxation. Corporations must also provide a corporate resolution to borrow articles of incorporation, by-laws, an annual report, and certification from the Registrar of Corporations that the Corporation is in good order. Partnerships must provide a partnership agreement and all applicants must provide the percentages of local and non-local labor that will be required for the project.

CDA provides several useful services to assist potential loan applicants. These services include workshops and training in accounting and management as well as small business development services. In the past several years, CDA has provided grant funding to the Northern Marianas College Business Development center to sponsor a Graduate Internship Program that links Graduate students with small business operators. The graduate interns and the staff of the NMC Business Development Center provide services to small businesses such as assistance with feasibility studies and business plan development, market surveys, accounting training, and cash flow management training.

CDA also sponsors The Pacific Business Center Program at the University of Hawaii at Manoa. Via this program, a Business Development Specialist travels to the CNMI quarterly to provide business development services to CNMI businesses. Through the connection to the Pacific Business Center, CDA is able to offer a wide range of business development assistance and research services to its loan applicants.

Table 4.74: Commonwealth Development Authority Commercial Fishing Loans

Year	Loan Amount	Year	Loan Amount
1986	678,809	**1993**	1,256,232
1987	79,398	**1994**	1,113,100
1988	89,700	**1995**	495,501
1989	25,000	**1996**	755,500
1990	10,000	**1997**	432,745
1991	8,785	**1998**	872,500
1992	254,000	**Total**	**6,071,270**
Average annual loan amount			**93,404**

Source: Commonwealth Development Authority Annual Reports

CDA reports the value of all loans issued and to whom they were issued in its annual reports. Table 4.74 compiles the annual outlay CDA has made for commercial fishing and fish market

loans since 1986 as indicated in CDA annual reports. The table shows that CDA has loaned over six million dollars for commercial fishing operations since it's inception in 1986. The average annual amount of money loaned to commercial fishing operations from 1986 to 1998 was $93,404. Clearly, CDA makes significant commercial fishing loans annually.

While it appears that CDA is meeting the needs of the commercial fishing sector for loan finance, pelagic commercial fishermen intercepted during this study did not feel that way. Several fishermen indicated that the CDA loan process is far too difficult for them. Others felt that CDA only gives loans out to commercial bottomfishing enterprises. Still others were even more critical of CDA in stating that "they only give out loans to people related to members of their board of directors."

Pelagic fishermen also complained that some CDA loans for commercial fishing are not for legitimate commercial fishing operations. Reportedly, some individuals have taken advantage of the low interest loans to buy themselves a nice sportfishing vessel complete with a truck and trailer to haul it. Fishermen reported that some of these individuals make only token efforts to commercial fish and instead take another job to pay the loan. Some fishermen contend that these individuals never intended to be commercial fishermen. Fishermen on Tinian and Rota were even more vociferous in their statements regarding CDA. Some Tinian and Rota fishermen felt that it was pointless to even apply for CDA financing. They complained that they did not have good access to CDA offices and that they could not process the necessary paperwork.

Data on loan finance was collected during the intercept interviews conducted for this study. The results were described in the cost of production section (see Section 4.3) and show that fifteen percent of full-time and fourteen percent of part-time commercial pelagic fishermen are currently paying off loans. The interview question did not ask what the source of the loan was. However, given the finding of the following section on commercial lenders it is safe to say that these loans are CDA loans. In total, fifteen percent of all commercial fishermen intercepted are currently paying off commercial fishing loans.

Commercial Lenders:

Aside from CDA, there are a number of commercial lenders operating in the CNMI. It is possible that these commercial lenders could be a potential source of financing for fisheries development projects such as vessel purchases. In order to assess the loan finance climate for fishing vessel purchases, a telephone interview was conducted with loan managers of 5 commercial lenders in Saipan. Several of these lenders also operate on Tinian and Rota and it will be assumed that conditions there would be similar if not more restrictive than on Saipan. Thus, separate interview of lenders on Tinian and Rota were not conducted.

Every lender contacted indicated that they offer commercial loans for fishing vessel purchases. However, some lenders require collateral equal to the loan value in a tangible asset such as cash in the bank or real estate. In the most extreme case, no collateral value is allowed for the value of the vessel. However, several lenders indicated that they would give credit for the vessel value equal to a percentage of the vessels appraised value or purchase price, whichever is lower. The percentages indicated were between twenty and seventy percent the vessel value. All lenders indicated that insurance on the vessel would be a requirement and several indicated that they would also require life insurance. Terms varied from a low of 36 months to a high of five years and interest rates varied from ten to as much as thirteen and one half percent depending on lender and term.

Most lenders do not require a formal business plan; however, they all agreed that it would be very helpful. Demonstrated experience in commercial fishing was identified as highly important. All lenders indicated that they must follow due diligence requirements that include such things as evaluation of the applicants' personal credit and repayment potential from the revenues of the business. Some lenders indicated the need for an equity partner if the operation is a new business.

Of the five lenders interviewed, all indicated that they would be willing to provide commercial loans for commercial fishing vessels subject to their individual terms. However, only two of the five lenders have ever given out commercial vessel loans. The other three lenders indicated that they had not had anyone apply for a commercial fishing vessel loan.

Several of the lending managers shared their experiences with boat loans in the pacific region. A common thread in their comments was the belief that most commercial boat loans end in default. It was suggested that a reason for this was that vessel operators often overestimate expected revenues, underestimate how much time they will have to spend fishing, and underestimate costs of operation and maintenance. Another reason mentioned was that vessel operators don't understand that they must be completely vertically integrated. They must manage all aspects of the business from catching to marketing. A common feeling among lenders was that some fishermen are good at catching fish, some are good at selling fish, but few are good at both catching and selling fish.

Lenders also indicated that their terms on commercial vessel loans are restrictive because they usually only recover 10-20 cents on the dollar of the original loan value if the loan is defaulted. This is reportedly due to the expenses of cleaning up and maintaining the vessel and providing for temporary moorage or storage until a buyer can be found and/or collateral can be sold. Another reported difficulty is that land used for collateral is usually ownership restricted to indigenous people of the commonwealth. Several lenders indicated that ownership restriction negatively affects both the value of the land and the ability of the lender to re-sell foreclosed. Thus, even full collateral in land value is no guarantee that the lender will recover the loan value if there is a default.

Commercial Fishing Vessel Insurance

All potential commercial lenders in the CNMI would require insurance on the vessel with the lender as beneficiary. However, only one of the part-time vessels and none of the full-time vessels intercepted have insurance on the vessel. Further, the Commonwealth Development Authority indicates that they don't require insurance because it is too expensive for the fishermen to obtain. CDA requires a life insurance policy with CDA as the beneficiary instead. Thus, it seems that the price and availability of marine insurance for commercial fishing vessels is a potential constraint on development of the domestic pelagic fishery.

Investment in larger boats and more efficient harvesting equipment without insurance would expose a fishing venture to considerable risk. Presumably, larger vessels of the longline type would fish in the northern islands, the western seamounts, to the far corners of the EEZ adjacent to the CNMI and even in international waters. These vessels, if properly equipped, could take trips possibly lasting two or more weeks. The length of such trips and distance from port necessarily exposes the vessel to occasional bad weather. However, it is the threat of storm events that creates the greatest risk.

The CNMI is located in the typhoon belt of the Western Pacific Ocean. The CNMI Emergency Management Office continually maintains typhoon condition four, which means that a typhoon could strike within 72 hours. The prime typhoon season runs from August through December. Thus, fishing vessels are seasonally exposed to increased threat of typhoons. In 1997, which was an El Nino year, there were five major typhoons (Winnie, Ivan, Joan, Keith, and Paka) that passed through the waters of the CNMI. In contrast, there have been few typhoons that have threatened the CNMI since 1997. However, the threat is always present that a typhoon can strike. Clearly, a commercial fishing venture would want to mitigate the risk of loss or damage of the vessel by acquiring vessel insurance as well as liability insurance that would cover damage to the environment. The apparent high cost of such insurance in the CNMI could be a development constraint for locally based vessels.

4.7.3. Problems Encountered

No significant problems were encountered in conducting the research for the regulatory and finance review. The Commonwealth Development Authority and Private Lenders were quite helpful and government agencies in the commonwealth provided considerable assistance with clarifying laws, regulations, and policies.

4.7.4. Conclusions and Recommendations.

The existing small boat pelagic fleet in the CNMI is not constrained in any way by local or federal regulations. There are no licensing requirements, limits on catch, or any other limits on their fishing activities. In addition, local fishermen are given a considerable tax variance on income generated from fishing. Most federal regulations do not apply to the existing fleet. One exception is the Commercial Fishing Vessel Safety Act. Vessels intercepted during this study were found to be minimally equipped with safety gear and not in compliance with the vessel safety act.

Expansion of the fishery into a longline fishery would involve compliance with several federal regulations. A longline permit must be applied for and there are vessel logbook and reporting requirements that must be met. These types of requirement are fairly standard in large-scale fisheries and should not present much of a burden. Further, there is currently no limitation on harvest, vessel size, number of vessels, or amount of gear that can be used in longline fisheries of the Western and Central Pacific excluding Hawaii. There is a 50 mile closed areas around Guam that protects local small boat fishing. However, it would be difficult to argue that these federal regulations are excessive or overly burdensome.

One condition that can be considered a constraint for U.S. longline vessels that might wish to fish in the area is the status of ownership of the EEZ. U.S. vessels that have obtained a longline permit are allowed, under federal regulations, to fish in open waters of both the EEZ's of the CNMI and Guam. However, the CNMI maintains that it has control over fisheries resources in the EEZ and has gone to court to make its claim. The disagreement over ownership of the EEZ, combined with the potential passage of the NMI Fisheries Act creates a very uncertain regulatory environment that is hostile to fisheries development in the CNMI. The contradictions between the proposed local laws and federal laws and regulations would be likely to discourage U.S. longline vessels from considering homeporting or operating in the CNMI. Several operators in Guam expressed reservations about fishing in the EEZ of the CNMI because of this problem and because of the local business license fee.

The CNMI requires a commercial fishing business license for large vessels and charges $50 per net ton of the vessels declared tonnage annually for the license. A 150 ton longline vessel would be required to pay the CNMI $7500 per year for a commercial fishing business license. The potential profitability of longline fishing in the EEZ of the CNMI has not been demonstrated and oceanographical conditions may be a limiting factor. Thus, the cost of this fishing business license may be considered a constraint on development of large-scale longline fishing.

The review of finance available in the Commonwealth shows that private finance for commercial fishing operations is constrained by extreme collateral requirements, high interest rates, and short repayment schedules. In contrast, the Commonwealth Development Authority (CDA) provides low interest loans to commercial fishing operations. CDA requires that fishermen devote considerable time and effort to developing a business plan and application package, which can only be expected of a financial institution that will bear risk of loan default. Some fishermen, however, feel that CDA's requirements are too difficult and that CDA does not make loans available to all fishermen on an equal basis. In light of fishermen's opinions, it seems that CDA may wish to investigate ways it may improve its reputation and level of service provided to local pelagic fishermen. However, it does not appear that the availability of business finance is constrained so long as CDA continues to serve the commercial fishing industry.

4.8. ASSESSMENT OF THE ECONOMIC DEVELOPMENT POTENTIAL OF CNMI PELAGIC FISHERIES.

The overall goal of this study was to assess the economic development potential of the pelagic fisheries of the CNMI. Five primary research objectives were pursued in conducting the assessment. The focus of those investigations was to determine if and to what extent each of the factors analyzed could be considered a constraint on development of the domestic pelagic fishery. However, another goal of the study was to identify ways in which the domestic pelagic fishery might be developed. Thus, it will be useful to summarize the finding of each of the investigations presented previously by evaluating the potential, or lack thereof, for various kinds of domestically based pelagic fisheries development to occur in the CNMI.

4.8.1. Expansion of current small boat troll fleet.

One potential development effort might be expanding participation, and thereby expanding harvests, in the current small boat pelagic fishery. Though a capacity database could not be developed from vessel registry data, there appears to be considerably more vessels available than are currently being used in the fishery. It is a simple matter to outfit these vessels for the troll fishery. In addition, data from the CNMI Division of Fish and Wildlife suggests that past participation in the fishery has been greater than current participation. The current fleet is primarily trailered and the necessary infrastructure to support more of this type of vessel is available and is being improved. The results of the SPC fisheries assessment for the Marianas suggests that considerably more skipjack tuna is available for harvest in the waters of the CNMI than is currently being harvested. Thus it seems that the capacity exists to expand activity in the fishery and the stocks of skipjack are sufficient to promote expansion. However, catching the fish may not be the difficulty.

The results of the analysis of profitability in the existing fishery suggest that the enterprise is profitable on average. However, fishermen report capability to catch more fish than they can sell. This appears to be because the market is limited to local consumption and some restaurant buying

and is easily saturated by the current harvesting capacity. Expansion into the greater restaurant and resort hotel market is constrained by high quality and competitively priced imports of yellowfin tuna from Guam. Thus, it does not appear that the current local market for fresh pelagic fish can support expansion of the local fishery without some improvement in that market.

4.8.2. Construction of a Centralized Fishing Market

A method of market improvement that has been proposed is the development of a centralized fish market. There are several reasons why this idea has broad appeal among government and fishermen alike. The idea is that a centralized market would provide a well-known location for both buyers and sellers. Bringing buyers and sellers together in this way is hoped to reduce the time and effort necessary for both to transact business. Another possibility is that the market facility might allow expanded harvest by increasing total sales.

In its simplest form, a centralized market consists of stalls or booths operated by individual vendors (e.g. fishermen). However, a centralized market could provide a facility for holding and freezing of product in times of overharvests. It could also provide for some processing and/or value added re-processing of fish. Of course, adding such facilities to the market and making them available to fishermen will entail installation, operating, maintenance and management costs that would need to be recovered by the market unless it is intended to be a subsidy program.

There are also several reasons why a centralized fish market may prove difficult to operate successfully. A major reason is that it could displace existing private markets that have invested in their own infrastructure in the form of stores, processing facilities, and refrigeration. If the market is government run those who are operating private markets currently may see the centralized market as unfair competition.

Local indigenous people may not prefer a centralized market over the small markets that exist in villages around Saipan. If local residents prefer to shop near their homes instead of traveling to a centralized market away from their homes the centralized market may have difficulty attracting them. Small local village markets often provide credit to their customers between pay periods and may have considerable customer loyalty.

Though fishermen like the idea of a centralized fish market their idea of how it should be run may not be in agreement with the realities of how it would be run. This study has found that fishermen want a market that will buy all of their catch at their price. They do not want a place where they can sell it themselves nor do they want to sell on consignment. At present, fishermen end their trips early because they have difficulty selling all their fish in one evening. Unless they hire someone to staff a booth or stall they would have the same difficulty in that they would be required to sell the fish in a stall at the centralized market each evening. What fishermen really want is a buyer to buy the fish each day and handle the operation of selling and or processing it.

Another difficulty with the idea that the centralized market could expand harvest is that the current local market for pelagic species appears to be saturated. Under these conditions, expanded harvests would increase the daily quantity supplied in the local market, which might actually push prices down. If fishermen see this as a result of selling at a centralized market they may prefer to sell via other market channels.

Unless it is a complete government subsidy a market facility will have to charge some fee to cover its cost of operations. Such costs will be born by fishermen, which could affect their profitability and their willingness to deliver fish to the market. Thus, the facility must be at

minimal cost to the fishermen to be successful. This is evidenced in the extreme by the situation encountered in Tinian. The farmer and fishermen's market in Tinian has not had success in selling fish. The prime reason for this is that they require that fishermen take a decreased price so that the market can make enough on the transaction to cover costs. However, Tinian fishermen have been unwilling to take this cut in price. This study has found that fishermen want to dictate market price. Thus, there appears to be real risk that fishermen, who want to be price setters, may not sell to a market at a lower price if they feel they can do better door to door, at dockside, at roadside, or in their own markets.

The centralized fish market may be able to eliminate the supply consistency problems that buyers have complained about by allowing commercial fishermen, charter operators, and even recreational and subsistence fishermen to sell at the market. However, if the market induces participation by people not currently operating it may actually harm the fishermen who are operating commercially now. If there is a known place to sell many more fishermen may go fishing and try to sell at the market. The increased supply that results would tend to lower prices to the benefit of consumers. However, lower prices will reduce the profits of existing operations.

The market may have difficulty selling to hotel and restaurant buyers because of quality, consistency, and product form limitations. Imports of high quality pre-processed yellowfin from Guam will be difficult competition for the centralized market. In all, a centralized market would face difficult challenges and its success would likely depend on how actively fishermen were involved in its development as well as on the quality of its management.

4.8.3. Export Market Situation

During the intercept interviews and focus meetings several fishermen commented that there is a need for an export market in order to sell everything that they can catch. Potential target markets for export include Japan, Korea, and Hawaii. Several individuals have developed export market connections and have exported high valued ($4.50 per lb.) bottomfish such as onaga and grouper to Japan. However, the ability of the local pelagic fishery to export its current catch appears to be limited by many factors.

The current small boat pelagic fleet operates at high cost and restricted volume when compared to other types of vessels such as longliners. Many of the fishermen intercepted during this study indicated that the rising price of gasoline has seriously cut into their profits and caused them to try and raise ex-vessel prices. As a result, the current prices of local fresh skipjack are near $2.00 per pound for the whole fish. In comparison, the wholesale cost of longliner caught gilled and gutted yellowfin imported from Guam is currently about $2.27 to $2.50 per pound. Given that these fish are gilled and gutted, on a yield basis their price per pound of meat product is less than locally caught skipjack. Thus, locally caught pelagic fish are overpriced and not competitive. Fishermen would have to reduce price quite a lot to be competitive in an export market.

Another issue is the quality of the fish landed locally. Local fishermen do not use quality-enhancing practices such as bleeding and slush icing their fish. They also use too little ice to cool the catch. In addition to these problems, the local trolling method sometimes causes the fish to struggle on the line in the warm surface waters resulting in burnt tuna syndrome. The PI has experienced this problem with locally caught skipjack and yellowfin purchased from local vessels. In contrast, longline caught yellowfin and bigeye tuna are caught in cooler subsurface waters and the gear limits their struggle. If bled, gilled and gutted, and brine chilled as is currently the practice on board longliners delivering to Guam, these fish are of superior quality to

pelagic fish currently being landed locally. Thus, major improvements in quality would also be necessary for the current local pelagic fishery to expand into an export market.

During dockside focus discussions, some fishermen also mentioned the possibility of exporting skipjack to canneries. The fundamental problem with this idea is that the current cannery grade tuna price is about $400 per metric ton (Casamar, 2000) or $0.40 per kilogram. On a per pound basis that equates to less than $0.20 per pound or only about ten percent of the current fresh pelagic price in the CNMI. One reason for this very low price is that current warehouse inventory of canned tuna is quite high and large-scale tuna fishing capacity appears to be in excess of current needs. This was clearly the case in late 2000 as canneries in American Samoa stopped production for an extended period and fishing fleets remained in port (Casamar, 2000). Thus, exportation of locally caught tuna to canneries does not appear to be viable at this time. Further, the small scale and relatively high cost exhibited in the local fishery makes it unlikely that export of tuna to canneries will be feasible unless major changes in the scale and cost of the fishery occur. Such changes would likely require use of large scale Purseine and/or longline vessels.

Fishermen and others suggested that an export market for mahimahi should be developed. The idea is that mahimahi are highly valued in Hawaii and could be shipped fresh via air on Continental Micronesia, which has a daily early morning flight to Honolulu via Guam. The prospect of exporting mahimahi was discussed with Manny Duenas, President of the Guam Fishermen's Cooperative. Mr. Duenas indicated that the Guam Coop had tried to export mahimahi to Hawaii in the past but lost money on the transaction. He stated that the "Hawaii markets won't pay as much for fresh mahimahi that isn't caught in Hawaii as they will for fresh local catch."

There is a possibility for development of an export market similar to the export market for yellowfin and bigeye tuna that is operating through Guam. Longline vessels could land fish in Saipan for air transshipment. The port facilities are adequate, however, some development of fishing vessel servicing would likely be needed. A fishing agent with access and connections in Japanese markets would also need to be willing to operate in Saipan. There are many such agents operating in Guam but whether they would be willing to operate in Saipan depends on the comparative economic benefits of doing so. Currently, Guam is the preferred port over Saipan due to its facilities, costs, airline service and proximity to prime fishing grounds in Micronesia.

4.8.4. Local Processing

Currently no large-scale local processing facilities are in operation in the CNMI. Some local retail establishments offer to loin tuna once it is purchased and retail supermarkets process fish into steaks, loins, and cut sashimi. Some retail establishment operators report that their customers prefer to purchase the whole fish, whether it is reef fish, bottom fish, or pelagic fish so they don't bother with processing. Fishermen intercepted during the study also indicated that there is no reason for them to gut or loin their fish because buyers want the whole fish. It is true that some fishermen reported freezing fish that they couldn't sell immediately. However, they normally freeze the entire fish without gutting it so there is no processing involved.

There are several value added processing methods that might be profitable in the CNMI. Frozen mahimahi is currently available in individually vacuum packed portions for approximately $4.00 per pound at the local Price Costco. The origin of that mahimahi is Taiwan. Also available are various types of bottom fish and shellfish as well as salmon fillets. It may be possible for a small scale fish processing facility to process locally caught mahimahi and bottom fish into portion or fillet form, vacuum seal and freeze it and provide it to wholesale and retail markets. Of course,

the local processing facility would have to meet quality and price competition from the imported product currently being sold.

Another possibility would be drying or smoking various types of fish and selling the product to tourists and residents. In Pohnpei, for example, dried tuna and smoked marlin in vacuum bags is available at the airport. It is of high quality and comes in several product forms including dried, or smoked, and black peppered or hot peppered. It is of high quality, reasonable price and quite tasty. While the tuna used in Pohnpei is yellowfin, it is possible that skipjack could be used. The smoking method would be a particularly useful method for processing Marlin. Marlin is not a prized food fish locally and fishermen report having difficulty selling it. A market for smoked marlin could be developed with resort hotels, restaurants, tourists, and local residents.

Considerable cost is incurred in the processing methods mentioned above. These costs include equipment, facilities, labor, packaging, marketing, and utilities. The price of the finished product must recover these costs, including the input cost of the fish, and earn a profit margin for businesses involved in value added processing. What this means is that the current fresh consumption market prices are likely much higher than what processing facilities would be able to pay for fish. Processing buyers would likely be an outlet for catch that is in excess of the fresh consumption market demand. Thus, these processing methods could be used to more fully utilize current harvest and possibly expand harvests. However, the price premiums currently earned for fresh dockside sales would not be present in sales to a processing sector. Further, if harvests are considerably expanded to supply a processing sector the expanded supply would likely force the dockside fresh price down as well.

4.8.5. Fisherman's Cooperative

The development of a fishermen's cooperative could provide many benefits to local fishermen. By bringing together a wide membership including commercial fishermen, charter fishing operations and recreational vessels a cooperative can solve the problem of inconsistent supply that buyers complain about. A cooperative may also be able to operate as a non-profit organization so that it has a tax free status. A cooperative may also be able to provide ice at cost by operating its own ice making equipment. A cooperative can also operate their own store and processing facility. The facility can be small and efficient in order to minimize operating costs and could purchase fish from fishermen daily.

A major benefit of a cooperative is that it can offer an account system so members can purchase fuel and ice on account and net their costs against their receipts for the fish they sell. Thus, a member can sell his catch daily and get fuel on credit in order to go fishing even if the fishing has been slow and he hasn't made enough to buy fuel. Some CNMI fishermen intercepted during the course of this study reported having difficulty getting fuel for the next day if they couldn't sell enough fish. Such a system is far superior for the fishermen than the consignment system practiced by some market operators in the CNMI.

While all the above features of a cooperative are impressive, what must be made clear is that the cooperative must recover its operating costs and must compete directly with imports. As a result, the ex-vessel price per pound that a cooperative would be able to pay is likely less than the dockside price fishermen are used to getting. Some fishermen reported that they would not sell fish if they couldn't get their price. This raises the issue that cooperative members might join to enjoy all the benefits but cheat on the cooperative by selling at dockside or door to door. Thus, some enforcement of participation may be necessary and that may prove problematic.

Developing a cooperative is much easier than keeping it operating. Management quality as well as commitment on the part of its membership will be necessary to achieve success. It is recommended that the CNMI government explore supporting the creation of a cooperative. In doing so, it is recommended that the government consult directly with the President of the Guam Fishermen's Cooperative, Mr. Manny Duenas.

The government's role in developing a cooperative must be limited to facilitation. The venture must be run like a private business if it is to succeed. As was mentioned in the fishing history a cooperative was attempted on Saipan in the early 1990's but had failed within a few years due to management difficulties (Radtke and Davis, 1995). It would be wise for any agency or individuals attempting to start a new cooperative to focus efforts on creating a well-defined organizational structure, member rules, and punishments for cheating. Highly qualified management must be obtained or the endeavor will be doomed to repeat the failures of the past.

4.8.6. Large-Scale Processing

Large-scale processing of pelagic fish, such as cannery operations, has been suggested as a potential means for the development of domestic pelagic fisheries. This idea faces several difficulties. First, large-scale fish processing operations are not currently highly profitable in the region. Further, the compatibility of such an industry with the tourism industry is questionable. Another problem is that large-scale processing requires large quantities of water. The water system on Saipan is not currently capable of even providing 24 hour potable water to its populace. In some areas the water that is provided is highly saline. Tinian enjoys an ample supply of water to meet the needs of its current population. However, the Tinian Harbor Master Plan concluded that sufficient land is not available in Tinian to support large scale fish processing and that such industries are not in keeping with plans to develop Tinian harbor for tourism. Rota also enjoys an ample and high quality water supply. However, it has been shown that Rota's harbor facilities are not sufficient to support large-scale fisheries operations.

Another reason why cannery operations would be difficult to develop is the body of local regulations in place to protect the environment. The CNMI Division of Environmental Quality enforces both local and U.S. Environmental Protection Agency regulations on water discharges. In addition, the Office of Coastal Resources Management enforces local and federal coastal zone management regulations. Any proposed large-scale fish processing facility would be required to obtain local permits as a major land use as well as show that is would not adversely affect water quality, endangered or threatened species and historic sites. Public hearings would be involved and residents and businesses involved in the tourism sector could provide strong opposition to such a project. Discussions with various government officials involved with this process suggest that development of large-scale fish processing would face considerable difficulty and there is no guarantee that a siting would be allowed. Thus, it does not seem that development of large-scale fish processing is presently feasible.

4.8.7. Import Restrictions

One suggestion that was made by fishermen attending a focus group meeting was that the CNMI should place a high import tax on the importation of fish products to stimulate the local market for fresh pelagic fish. What has been determined is that the CNMI already imposes a one percent ad-valorem tax on imported foodstuffs, which includes imported fish products. Thus, fish importers are already paying this tax and would probably not be very receptive to it being increased. Further, consumers usually bear some portion of taxes and may be angered by an increase in such costs especially given the conditions in the local economy. Another factor is that

imposing increased taxes on imports in order to protect the local operators may make local operators less cost and quality competitive. In all, it is difficult to argue that increased taxes on imports to protect the small pelagic fishery that exists are warranted. The negative impacts on consumers and the tourism market would likely far outweigh the benefits that that would accrue to the small number of participants in the local pelagic fishery.

4.8.8. Longlining

The potential to develop tuna longline fisheries in the CNMI suffers from several conditions. The existing small boat fleet is not readily capable of utilizing that gear type. While some larger bottomfishing vessels do exist and could be fitted with longline gear, their operators neither have the knowledge necessary or the inclination to attempt to develop such a fishery. Further, U.S. registry longline vessel operators currently operating out of Guam expressed concerns over the status of EEZ ownership as well as the cost of obtaining a CNMI Commercial Fishing Business License. These factors combined with the high cost of fuel, minimal availability of large vessel servicing, and absence of fishing equipment suppliers make the CNMI less than attractive when compared to the Port of Guam. Thus, it does not seem likely that pelagic longline ventures will develop anytime soon in the CNMI. What is likely, however, is that Guam based U.S. vessels may legally fish the federal waters adjacent to the CNMI and deliver and re-provision in Guam. Of course, the CNMI would gain nothing economically from such fishing operations and since the CNMI is incapable of enforcing its EEZ claim due to lack of an enforcement vessel such operations may be occurring currently.

4.8.9. Transshipment

The location of the CNMI combined with its tourism industry and port infrastructure make it a potential location for the transshipment of sashimi grade tuna to Asian markets. Daily airline flights offer ample space for transshipping and the infrastructure available could be used for such operations. However, it has been shown in this study that Guam enjoys a major comparative advantage over the CNMI for such enterprises. The Port of Guam is a duty free port, which translates into significantly lower fuel cost for vessels bunkering fuel in Guam vs. the CNMI. Further, port costs as well as immigration and customs clearance fees are less than in the CNMI. Since the Commonwealth Ports Authority is planning to increase its fees in the coming years this situation will worsen. This combined with the fact that Guam is closer to the primary fishing grounds seems to rule out the development of sashimi tuna transshipment in the CNMI.

4.8.10. Foreign Fishing

This study was intended to determine ways that domestic pelagic fisheries might be developed so that foreign fleet utilization of the resources of the CNMI EEZ would not be considered necessary. As has been detailed above, the potential for developing domestic pelagic fisheries in the CNMI appears to be quite limited. However, the potential for developing foreign fisheries also appears to be limited by the fact that the waters of the CNMI are not likely as productive as waters further south and east. The SPC fisheries assessment concluded that "The Mariana Islands have little advantage in attracting foreign fleets due to : 1) reduced catch rates, 2) EEZ size, 3) extensive regulations on foreign fishing, 4) potential negative interactions with other fishery sectors." Based on SPC estimates of potential skipjack harvest, potential revenue at current cannery prices and assuming a five percent royalty was found to be only about $110,000. Thus, it seems that foreign fishery development is neither likely nor is it warranted given the small potential returns and potential for negative impact on the domestic pelagic fishery.

4.8.11. Concluding Recommendations

Development of larger-scale domestic pelagic fisheries in the CNMI does not appear to be likely at this time. The primary constraints on such development are that the infrastructure that is available in the CNMI is not oriented toward commercial fishing and it is not cost competitive with the Port of Guam. Further, locally based pelagic vessels must compete with imported fish landed in large volumes in Guam. Any locally based transshipment operation would also have to be competitive with Guam operations. Large-scale fish processing development is also not seen as a potential for development due to potential conflicts with the tourism sector, environmental concerns, and the fact that such operations are currently struggling in the region.

In light of the limited potential for development of larger-scale pelagic fisheries, it seems prudent that the CNMI government should focus its efforts on promoting the existing small boat pelagic fleet. Vessels operating in the existing pelagic fleet are generally profitable at this time. Increased activity, participation, and harvests in that fishery do not appear to be constrained by regulations, finance, infrastructure, or labor. The primary constraint on the local small boat pelagic fishery is its limited local market. The limited local market has likely been negatively affected by a decline in the local economy. Significant import competition also limits that market and will likely continue to do so.

A major operating cost in the current pelagic fishery is the cost of fuel. All of the vessels intercepted for this study used outboard powered vessels that burn gasoline. Since gasoline costs around $2.14 per gallon in the Commonwealth, expenditures on fuel are a major problem for fishermen. The commonwealth may want to consider providing a rebate of the liquid fuels tax for commercial fishing vessels. Of course, commercial fishermen already benefit from considerable income tax breaks on fishing income so the provision of an additional tax break must be carefully considered.

One way to make the local fishery more competitive with imports and potentially more profitable is to provide fishermen with education and training on quality and handling. Techniques on stunning, bleeding, and slush icing fish are not well known or used by participants in the current fishery. Training on alternative fishing techniques such as small-scale vertical longlining could also provide some benefit in this fishery, especially for the larger vessels.

Perhaps the best approach the government could take to promoting economic development in the existing pelagic fishery is to promote market development. A centralized fish market may be a first step in such development if fishermen are willing to participate. Such participation could be improved if the government promoted the development of a commercial fishing association and created a commercial fishing advisory board. Development of a cooperative could be promoted within the commercial fishing association membership and could be patterned after the Guam Fishermen's Cooperative. However, it must be understood that these attempts at market improvement face considerable challenges to their success. Effective management, a commitment to participate on the part of the fishermen and minimal government involvement are all keys to success.

5.0 EVALUATION

In a project of this nature, it is educational to evaluate the level of success obtained in achieving the stated objectives of the study. The following discussions describe the extent to which the

project goals and objectives were attained. In cases where meeting the objective proved difficult, reasons for the difficulty are described. Any modifications to the original work plan that were undertaken to meet the objective are also described. Additional information of this nature can be found in the "problems encountered" sections that are associated with each of the objectives in the text of this document.

Objective 1: Focus Group and Capacity Database Creation

The first objective of this study was the development of focus groups of domestic fishermen and development of a domestic capacity database. This objective was not attained as originally planned and significant modification to the plan of work was required. As discussed in section 4.1, formal focus group creation was not successful on Saipan. Despite repeated attempts to hold formal focus group meetings and attempts to widely publicize scheduled meetings, very few fishermen attended. Thus, input from fishermen was taken from informal discussions at dockside as well as from input received in the course of conducting intercept interviews. This modification allowed significant input to be received from fishermen. However, this modification meant that much more time in the field was required to gather the input than was originally envisioned.

Focus group creation on Tinian was much more effective than on Saipan. However, group communication dynamics hindered the constructive flow of input. It is the impression of the PI that informal discussions with fishermen, which were also conducted at dockside on Tinian, were much more effective at gathering fisherman input than formal meetings. On Rota, informal meetings with individuals arranged with the assistance of the Rota Department of Commerce office worked well to gather input. In all, the intent of the objective of forming focus groups was met by using informal discussions with individuals or small groups of individuals.

Domestic capacity database creation was also a difficulty. The existing vessel record keeping system in the CNMI did not provide sufficient information to develop the database. As a result, the plan of work was modified somewhat by expanding the fishing capacity questions in the intercept interview. Unfortunately, this only provided information on those vessels intercepted.

Objective 2: Vessel Cost and Earnings Data Collection and Assessment of Production Efficiency.

This objective was met as planned via data collection in the intercept interviews. Analysis of investment, costs of production, harvests, and revenue was conducted to meet the objective. The only modification from the original plan of work was expansion of interview questions on vessel capacity that was intended to be compiled in developing the capacity database of objective one.

Objective 3: Identify economic conditions in the fishery labor market.

This objective was met as originally planned by gathering available data on historic participation in the fishery as well as via analysis of intercept interview data. Labor characteristics and returns to labor were analyzed and results were compared with other employment opportunities to determine that the current fishery is likely not labor constrained.

Objective 4: Identify Domestic and Foreign Market Constraints.

This objective was met as planned and no major modifications were necessary. The study was assisted greatly by the availability of the recently completed "Analysis of Saipan's Seafood Markets (Radtke and Davis, 1995). Information from that report was combined with analysis of

historic harvests and analysis of intercept interview data to assess the local market situation. In addition, foreign market potential was assessed utilizing interviews with foreign market contacts as well as published information on the status of foreign markets.

Objective 5: Identify Local Infrastructure Constraints

This objective was met as planned with only a slight modification. It was determined during the course of research that while significant infrastructure to support fisheries exists in the CNMI that infrastructure does not appear to be regionally cost competitive. Thus, much more attention was paid on assessing the comparative advantage enjoyed by the Port of Guam than was originally envisioned.

Objective 6: Identify Financial and Legal Constraints

This objective was met as planned and no major modifications were necessary. Officials within the Commonwealth Development Authority and private lending institutions were quite helpful in providing the information documented in section 4.7. In addition, review of regulations and legal structures utilized readily available sources as well as electronic media available on the internet.

Objective 7: Dissemination of the final report.

Once the final report is approved by the sponsoring agency, The National Marine Fisheries Service's Saltonstall-Kennedy Grant program, it will be prepared in both paper and electronic formats for distribution. The completed document will be distributed to local government agencies, locals legislators, as well as the Offices of the Governor and Lieutenant Governor, the Western Pacific Regional Fisheries Management Council and the NMFS Pacific Area Regional Office in Honolulu. Finally, paper copies will be provided to fishermen at dockside. It is expected that between 200 and 300 paper copies will be distributed. In addition, the final report will be converted to pdf file format for viewing by Adobe Acrobat reader and placed on an Internet web site at the Northern Marianas College.

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1.0 APPENDIX A: INTERCEPT INTERVIEW DATA COLLECTION FORM

Vessel_____Respondent_____ph_____
Date___/___/___Location:_____Time_____
Refusal_____ Referral to_____

1. What is your age? Less than 25years, 25-34, 35-44, 45-54, 55-64, >64.
2. What is your education level? JH; HS; some college; AA; BA/BS; other_____
3. How many years have you been fishing? _____years.
4. Do you own the boat you fish on? Yes No 5. Do other people use this boat without you? Yes No
6. Is your boat trailered or moored? 7. What is the boat length overall ____, width ____?
8. What type of engines do you have? outboard # _____HP_____ inboard #_____HP _____ gas diesel;
9. How much fuel do you carry?_____gallons. 10. How much water do you carry? _____gallons.
11. In what year did you buy your boat? 19___ 12. How much did it cost when you bought it? $_____
13. When was your boat built? 19___
14. Does your boat have cooking facilities, Yes No, sleeping facilities, Yes No? toilet facilities Yes No?

FOR 15-36 ASK:

A. Do you have (item) on board your boat? **If no, skip to next item. If yes ask B and C**.
B. How many (item) do you have on board and how much did you spend for (items)?
C. Was (item) purchased locally or off island?

15. CB radio	Y	N	#__	$_____	L	OI	26. Life Jackets	Y	N	#__	$_____	L	OI
16. VHF radio	Y	N	#__	$_____	L	OI	27. Flare pack	Y	N	#__	$_____	L	OI
17. SSB radio	Y	N	#__	$_____	L	OI	28. Fire Ext.	Y	N	#__	$_____	L	OI
18. Other radio	Y	N	#__	$_____	L	OI	29. EPIRB	Y	N	#__	$_____	L	OI
19. Depth Sounder	Y	N	#__	$_____	L	OI	30. Liferaft	Y	N	#__	$_____	L	OI
20. Fishfinder	Y	N	#__	$_____	L	OI	31. Fishing Rods	Y	N	#__	$_____	L	OI
21. GPS	Y	N	#__	$_____	L	OI	32. Manual Reels	Y	N	#__	$_____	L	OI
22. Radar	Y	N	#__	$_____	L	OI	33. Electric Reels	Y	N	#__	$_____	L	OI
23. Trailer & Hitch	Y	N	#__	$_____	L	OI	34. Lures & hooks	Y	N	#__	$_____	L	OI
24. Major upgrades	Y	N	#__	$_____	L	OI	35. lines	Y	N	#__	$_____	L	OI
25. Other items	Y	N	#__	$_____	L	OI	36. Coolers	Y	N	#__	$_____	L	OI

items_____

FOR 37-40 ASK:

A. Do you have (item) for your boat? **If no, skip to next item. If yes ask B and C**.
B. How much do you spend each month for (items)?
C. Was (item) purchased locally or off island?

37. Boat insurance	Y	N	$_____	L	OI	39. Moorage	Y	N	$_____	L	OI
38. Loan Payments	Y	N	$_____	L	OI	40. Other expenses	Y	N	$_____	L	OI

list other expenses_____

41. How much do you spend each month for maintenance and repair of your boat, equipment, and trailer?$_____

FOR 42-48 ASK:

A. How much money was spent on (item) on this trip?

B. How much money was spent on (item) on your most recent trip before this trip?

	This trip	Previous trip		This trip	Previous trip
42. Ice	$_____	$_____	45. Fuel	$_____	$_____ Gas Diesel
43. Bait	$_____	$_____	46. Oil	$_____	$_____
44. Gear	$_____	$_____	47. Food	$_____	$_____
48. Other (truck fuel etc.)	$_____	$_____			

49. Did the crew share these trip expenses? Yes No

50a. How far from port did you travel on this trip? _____ 50b. How far from shore?_____
50c. Location (if volunteered) _____
51a. How far from port did you travel on your most recent trip before this trip? _____
51b. How far from shore? _____
51c. Location (if volunteered)_____

52a. Who ran the boat on this trip? _____
52b. Who ran the boat on the most recent trip before this trip? _____

53a. How many fishermen, including you, were on board for this trip _____
53b. How many fishermen, including you, were on board for your most recent trip before this trip? _____
54a. What time did you leave on this trip? _____ am pm
54b. What time did you return from this trip? _____ am pm
54c. Why did you return to port at this time on this trip?_____

55a. What time did you leave on your previous trip? _____ am pm
55b. What time did you return from your previous trip? _____ am pm
55c. Why did you return to port at this time on your previous trip? _____.

56. Over the past 12 months, how long in hours was your longest trip? _____hours
57. How many trips do you usually take per month? _____

62. How many pounds of pelagic fish do you usually catch per month?_____lbs.
63. How many pounds of bottom fish do you usually catch per month?_____lbs.
64. How many pounds reef fish do you usually catch per month?_____lbs.

65a. What kind of fish were you trying to catch on this trip _____
65b. What kind of fish were you trying to catch on your most recent trip before this trip?_____

66a. How many pieces of Pelagic fish did you catch on this trip and what was the total weight?
Pelagic_____lbs_____pcs;
66b. How many pieces of bottomfish did you catch on this trip and what was the total weight?
Bottomfish _____lbs_____pcs;

66c. How many pieces of reef fish did you catch on this trip and what was the total weight
Reef fish_____lbs_____pcs.

67a. How many pieces of Pelagic fish did you catch on your previous trip and what was the total weight?
Pelagic_____pcs_____lbs;
67b. How many pieces of bottomfish did you catch on your previous trip and what was the total weight?

Bottomfish _____pcs_____lbs;

67c. How many pieces of bottomfish did you catch on your previous trip and what was the total weight?
reef fish _____pcs_____lbs.

68. People define commercial fishermen in different ways. How do you define a fisherman as commercial? (check all that apply)

_____sells at least one fish
_____sells fish to cover expenses
_____sells fish to make a profit
_____sells fish to friends and neighbors
_____sells fish to stores and restaurants
_____earns the majority of their income from fishing
_____relies solely on fishing to provide income
_____Other_____

69. How do you define yourself as a fisherman? (check all that apply)

_____Subsistence _____Part-time commercial _____Other_____
_____Recreational _____Full-time commercial _____

70. What was your household's total income in the past year, including fishing income if any?

_____less than $10,000 _____$20,000-$30,000 _____$40,000-$50,000 _____$75,000-$100,000
_____$10,000-$20,000 _____$30,000-$40,000 _____$50,000-$75,000 _____more than $100,000

71a. Are you currently employed ? yes no. 71b. If yes, what is your annual income from your job?_____
71c. Are you currently retired yes no. 71d. If yes, what is your annual income from retirement?_____

72. On trips taken during the past 12 months, what did you usually do with your fish?

_____All of the catch was sold
_____Some of the catch was sold
_____Some catch was taken home to eat.
_____All of the catch was taken home to eat
_____Some of the catch was given away to the crew
_____Some of the catch was given away to friends/neighbors/coworkers.
_____Other _____

73. On the trips when you didn't sell any fish during the past 12 months what percent of the time did you
Troll % _____ Bottomfish %_____ Mixed (Troll/Bottomfish) %_____ reef fish (net or spear)%_____
Mixed Other(_____/_____) %_____

74. Do you have any suggestions concerning how the CNMI fisheries should be developed, managed or studied?
_____
_____
_____
_____

75. Do you ever sell any of your fish? yes no

IF Q75=NO THEN STOP ELSE CONTINUE ON NEXT PAGE:

76. When you sell fish do you sell
enough fish just to cover trip costs enough to make some profit or all of the fish?

77. Are you going to sell any of the fish you caught on this trip? yes no
78. If yes, what price do you expect to get? (type/$)_____
_____
79. How do you know what price you will get? _____
_____

80. Of all your trips over the past 12 months on what percent of the trips did you
___% not sell any of the fish? ___% sell fish to make a profit, ___% sell fish just to cover your trip costs?

81. On trips taken during the past 12 months when you did sell some of the fish what percent of the time did you
Troll % _____ Bottomfish ____% Mixed (Troll/bottomfish) ____% Other_____%

82. On trips taken during the past 12 months what percent of the pelagic fish were sold? _____%. What percent of bottomfish wer sold?_____% What percent of reef fish were sold?_____%

83. How do you pay your crew?
____% share of gross revenue of ____% share of net revenue of, ___% share of catch of ___%, wage _____$/hr,

84. How many years of combined fishing experience does your crew have? _____total years?
85. How many years of local experience does your crew have? _____ years.

86. Are your crew members guest workers in the CNMI? #1. Yes No. #2 Yes No. #3. Yes No.
#4. Yes No. #5. Yes No. #6. Yes No.

87. Do your crew members have jobs other than fishing?. #1. Yes No. #2 Yes No. #3. Yes No.
#4. Yes No. #5. Yes No. #6. Yes No.

88. How much education does each of your crew members have? #1._____ #2._____ #3._____
#4._____ #5. _____ #6._____

89. Do you bleed your fish when you catch them? yes no
90. Do you ice your fish down when you catch them? yes no
91. Do you use salt water mixed with ice to chill your fish? yes no

92. Where do you usually sell your fish? (Double Check the one used most often)

	Pelagic catch	Non-Pelagic catch
Markets/stores……	_____……	_____
Restaurants/bars……	_____……	_____
Roadside sales ……	_____……	_____
Friends/neighbors/coworkers/family……	_____……	_____
Other _____	_____……	_____

93. Can you usually sell all of your fish if you want to? Yes No. If not, why not? _____
_____

94. How much in gross sales does your boat usually make per year? $_____

95. After expenses, what percentage of your total household personal income came from fishing? _____%

END

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